Psychogeography in the Digitally Expanded City

by

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Abstract

This thesis investigates the digitally expanded city, (i.e., how the urban implementation of ubiquitous and mobile computing shifts and shapes how its inhabitant's experience and perceive the city), through the development of a psychogeographically influenced art practice.

Psychogeography is the study of the geographical environment's influence on the mind or behaviour using avant-garde art walking techniques. This thesis engages with the intersection between digital technology, the city and the perceiving body, by expanding the critical creative practices of psychogeography through the development of an original art practice to investigate the role of ubiquitous and mobile computing in the production of space in East London. Psychogeography brings to digital cities research access to the complexity of the embodied, culturally and socially situated experience of the perceiving body located in space.

This work is situated in an interdisciplinary space across fine art performance, cultural geography and Human-Computer Interaction (HCI). Empirical data is gathered from four performance events. This thesis situates itself within East London, which is approached from three interrelated perspectives: 1) Virtual Space, focuses on the subjective and intersubjective understandings of the digitally expanded city; 2) Actual Space, explores the materiality of digital infrastructures; 3) Potential Space, investigates digital representational practices.

The contribution takes three forms. The first is a critical framework and lexicon. It presents a meta-model that maps the processes and actants that were observed to play an important role in the production of space in East London. The second provides an overview of the digital geography that emerged from the combined psychogeographically-inspired events presented within this thesis. The third provides an understanding of using a psychogeographically-inspired art practice within spatial research. It outlines the kinds of knowledge a psychogeographical art practice can produce and concludes by exploring their implications for future ubiquitous and mobile computing research.

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Practice Inserts

Practice inserts introduce each of the three substantive empirical chapters. Practice inserts include performance writing and other visual material – for example, photographs, screenshots and a link to sound recording. Practice inserts bring into the thesis aspects of performance practice that cannot be reproduced through analytical writing.

Performance inserts are presented in landscape format and use courier typeface to avoid confusion with the analysis and better present visual materials.

The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it.

Weiser, 1991

'How is computer technology deployed and whom does it serve? We know enough in this area to suspect the existence of a space peculiar to information science, but not enough to describe that space, much less to claim close acquaintanceship with it.'

Henri Lefebvre, 1991

1 Introduction

How does it feel to walk the streets of East London when the city has been expanded by technologies that blur the boundary between the physical world and the digital realm, between physical objects and their representations in the digital field as data?

Psychogeography is the study of the geographical environment's influence on the mind or behaviour using walking techniques from avant-garde art. This thesis develops an original psychogeographically-inspired art practice to research the convergence of digital technology and the physical space of the city. The investigation aims to discover whether the knowledge produced from psychogeography's creative practices can critically inform and enhance the discourse around the role ubiquitous and mobile computing plays in the production of space in East London.

Digital technology is rapidly converging with the physical space of the city, constructing a material infrastructure of cables that feed an invisible infrastructure of wireless signals, connecting a multitude of digital devices. This convergence between digital technologies and the city has enabled a reconfiguration of the spaces that exist within the city and the creation of new types of space: for example, 'communication spaces' (Healey, White, Eshghi et al., 2008). Digital technology can now be shown to play an active role in the production of the space of the city through digital representational practices. Examples are those encoded within GIS systems, such as Google Maps,[1] a digital mapping service developed by Google, or less explicitly embedded within the hardware and software of ubiquitous computing, such as the London Oyster card system[2] that creates spatial representations of its users within computer systems. The infrastructure of mobile and ubiquitous computing also impacts on city space, from the siting of mobile phone masts within the city to the digging up of the roads to lay optical fibre networks that link large anonymous data centres. The use of wi-fi and mobile computing has subtler impacts on city space as it transforms habits: for example, the move from town centre to online shopping or young start-up professionals being able to able to work from urban coffee shops. The relationship between digital technology and the city is a complex one in which the convergence of digital technology and the city can be shown to have expanded not just the space of the city but what the space of the city is. I refer to this phenomenon as the digitally expanded city.

[1] Google Maps. Available at: https://www.google.co.uk/maps/ [Accessed 1/7/2018]
[2] The Oyster card is a pay-as-you-go payment method for public transport in London in the United Kingdom. Available at: https://tfl.gov.uk/fares-and-payments/oyster [Accessed 1/7/2018]

There has been little critical discourse within the computer science research community about how computer science's representational and spatial practices are extending beyond the technical domain, creating material and social effects that shape the spatial understanding and experience of the people who live within cities. At a moment of rapid growth in ubiquitous and mobile computing, this research believes that such discourse is essential, for two key reasons, as follows.

1) To develop a discursive field so that critical aspects of ubiquitous and mobile computing's spatial practices can be made visible and brought into a wider discourse; 2) So that future technical systems can be developed from the perspective of a better understanding of the role they play in the production of space.

As ubiquitous and mobile computing becomes implemented in real-time, real-world environments they breach their own disciplinary boundaries. Once active in the city, digital spatial systems become entangled in wider cultural systems of meaning and power. They become embroiled with the messy complexity of how individuals produce understandings of space, which are simultaneously personal and emotional and social, cultural and political. Carrying out research into such phenomena requires an interdisciplinary approach that can unite technology and culture and bring into dialogue the city, the body and digital technologies.

This research seeks to bridge disciplinary boundaries by finding common ground between contemporary geographical practices that focus on the cultural geographies and digital cities, critical artistic practices that bring to the fore the emotional, embodied and socially situated aspects of how we know and experience cities, with the emerging recognition of the importance of spatial representations within ubiquitous and mobile computing (Dourish, 2011). One of the defining features of both ubiquitous computing (ubicomp) and mobile technologies is that they bring together subjective experience, spatial theory, and technology. If ubicomp and mobile research is to move beyond an 'implications for design' approach, this will require experimental research methods that can integrate these disparate research disciplines. Failure to do so risks producing compartmentalised, partial and fragmented knowledge. One practice that shows potential for finding common ground between these disciplines is psychogeography, and to achieve this goal this thesis develops and extends psychogeography as a critical spatial art practice.

1.1 Biography

The decision to interrogate the digitally expanded city through psychogeography emerged as an integral development within my art practice. My background is rooted in fine art, having

studied for a BA (Hons) in Sculpture at Chelsea College of Art and Design followed by an MA in Sculpture from the Royal College of Art. While studying Fine Art, I was heavily involved in the global anti-capitalist activist movement. This experience alerted me to the practices of historic avant-garde movements such as DADA, FLUXUS and the Situationist International. I became interested in art practices that take place beyond the traditional art world and in particular, site themselves within the everyday life of the city. It was at this point, in the early 2000s, that I carried out my first experiments using psychogeography.

From the mid to late 2000s, I worked alongside other activists, Laura Grace Ford and Robin Bale, to develop a collective practice under the name 'We Are Bad'. We Are Bad saw direct parallels between the nascent gentrification of inner-city areas of London and the demolition of working-class areas of Paris in the 1950's which had prompted the Situationist International to develop psychogeography. We Are Bad aimed to reinterpret psychogeography as a form of anti-gentrification activism. Throughout my involvement with We Are Bad, I became interested in the parallel but interconnected relationship between gentrification and the growing spatial impact of digital technologies. For example, prior to the inclusion of GPS technologies into mobile phones, I carried out a drift in which my own location was tracked using the triangulation of GSM mobile phone towers. My live location data was broadcast via a pirate radio station as I took part in a drift focused on the redevelopment of the Kings Cross area. To gain a better understanding of the emergent digital city, I developed a personal art practice that used code and electronics to critically question the impact of digital technology on everyday life.

In 2012, I joined the Media Arts Technology doctoral training programme hosted by the School of Electronic Engineering and Computer Science (EECS), Queen Mary University of London. My aim was to develop my understanding of computer science and the technologies and philosophies involved in producing the digital city. While the training centre was based in EECS, it allowed interdisciplinary research. I chose this programme because its interdisciplinary nature enabled me to include on my supervision panel Professor Stefan Poslad, an expert in ubiquitous computing, alongside Professor David Pindar, a Cultural Geographer and expert in psychogeography.

As part of the first year of the training programme, I carried out a research project, supervised by Professor Poslad. This used GPS and mobile phone technology to develop a locative sound walk through Berlin. The project was showcased in August 2013, as part of an event organised by the Berlin based Transmediale festival. The research aspect of the project used ethnographic methods, common in Computer Science research, which focus on human computer interaction (HCI). The results questioned the way space was often conceptualised at

this time, as a static backdrop that could be either overlaid or augmented with digital content. My fine art background and specific collective experiments with psychogeography, made me dissatisfied with a view of space that emphasised the binary separation between digital and physical space. I felt that the objective distance required by the ethnographic method that I had used within that research excluded the subjective affective experience that was so important to fine art and in particular, psychogeographic practices. The research carried out within my thesis emerged as a response to the findings of that initial study. It aimed to retreat from a direct focus on any singular technology by bringing together the disparate fields of fine art, cultural geography and computer science, to interrogate the production of the digitally expanded city from multiple perspectives and to develop an understanding of the relationship between digital technology and urban space that maintained the complexity of subjective and inter-subjective affective experience.

1.2 The need for psychogeography

Psychogeography is a technique that is rooted within the avant-garde art tradition of the Situationist International, but more recently has come to the interest of HCI researchers interested in areas of computer science that bring together digital technology and the physical body in space. Examples include work on locative media (Tuters, 2004a; Chang and Goodman 2006), virtual reality (Elias, 2010), game design (Flanagan, 2009) and mobile interface theory (Farman, 2012, p.50). What psychogeography brings to research is the complexity of the embodied, culturally and socially situated experience of the perceiving body located in space. This thesis investigates the potential of its techniques to take up some of the critical challenges posed to ubicomp research by Dourish (2011) by bringing into ubiquitous and mobile computing research the sort of embodied, culturally situated, sensorial, political, social experience of the city necessary to develop an understanding of the relational nature and complex forces involved in the production of urban space.

At the heart of psychogeography is the exploration of the city using unstructured walking techniques, referred to by British psychogeographers as ‘drifting’. Drifting is favoured as a form of experiencing the city as it affords more possibilities for interaction with, and exploration of, unexpected sites, and is less isolated than travelling in a vehicle. ‘Drifts’ are always social events carried out by two or more walkers, making them ideal for researching the social nature of spatial production. The drift can be viewed as a form of experimental behaviour, an opening oneself up to the world, with the expressed aim of exploring, subverting and re-imagining city space.

This thesis develops an original performance art practice that extends the practices of psychogeography to disrupt the everyday experience of the city, an act of estrangement that intends to move the participants beyond their everyday understanding of the city, making the familiar unfamiliar, and in doing so exposing the practices involved in constructing and reconstructing their understanding of space. It is a strategy that aims to shift ubicomp and mobile computing research from a fixed representational view of cities and those who inhabit them towards a view of cities as socially produced in practice, maintaining the rich human and affective context.

A psychogeographically-inspired art practice required a research methodology that understands performance-based interventions. It required a methodology that can gather data from the non-representational and affective experience of waking the digitally expanded city while remaining observant of the social processes through which space is produced. It required a method that could present its findings in a form that retains the performative qualities of the event. Dewsbury's (2010) 'performative, non-representational, and affect-based research' methodology was adapted to the specificity of psychogeography to gather and present empirical data.

The research has been carried out through four performative psychogeographical drifts in one area of East London, centred on Hackney Town Hall and stretching between Old Street in the west, the A12 to the east, Finsbury Park in the north and the Isle of Dogs to the south. East London is an area closely associated with developing digital industries. It is currently a major site of digital production, and has historic ties to the practice of psychogeography. Each walk expands psychogeographic techniques in different ways to focus on different aspects of the way the city has been transformed by digital technology. Each walk can be viewed as a different perspective that cuts into the geography of East London and forms the source material through which a more theoretical understanding of how people develop a spatial understanding of the digitally expanded city. These four drifts bring together different viewpoints on a single location. Each walk was developed to help answer the key research questions and to contribute to a digital geography of the area.

1.3 Practice Inserts

A performative approach to research requires some form of presentation beyond the event. To preserve the performative nature of my research, three practice inserts are included within the body of my thesis. While my research is not practice-based, I feel it is important to reflect on how the experience of participating in the drifts can be presented, beyond analysis and

documentation, in a form that preserves the subjective and affective qualities which lay at the centre of my choice to use psychogeographic practice to research the digitally expanded city.

My original approach to writing the thesis was to bring together both the subjective experience and analytical writing into a single performance writing style. However, what I discovered from this approach was that it excluded the computer science readers who were not familiar with alternative and creative writing forms. I wanted to maintain dialogue with computer science and contribute to all the academic fields that my research draws from. I therefore came to the compromise of separating the performance inserts and the analytical writing, setting up a dialectical relationship between the two forms of representation through montage.

The performance inserts are not intended to be documentation of the performance events, this can be found in the Methods section (Chapter 3). This thesis presents practice inserts between substantive empirical chapters that include performance writing and other visual material to disrupt the analytical text with other presentational activities that collapse the distinction between representing and performing experience.

The experience of the city which occurs through the practice of psychogeographic drifting is non-linear. It is broken and fragmented as one site of interest holds the attention only to be superseded by another. One ambience is disrupted by another as corners are turned and streets are followed. While rooted in the moment, psychogeography is not restricted to the temporal moment, it time-travels within the present, it reawakens ghosts from the past and folds potential futures into itself. Any attempt to present the experience gathered through the psychogeographic process must equally be formed through broken, non-linear images constructed from multiple vantage points and temporal transgressions. To include the subjective and affective experience of walking the digitally expanded city, my thesis develops an experimental writing style through the technique of literary montage, influenced by Walter Benjamin's concept of Denkbilder, often roughly translated as thought-images. Anca, 2009, Suggests 'that thought-images follow a similarly fractured and collage-like format to that of the actual process of seeing itself'. The experience of participating in a drift is developed into textual collages that change vantage points and temporal moments. This then involves moving away from documenting performance through text and aims towards expressing the experience of the event through experimental writing techniques. Dewsbury, 2015, describes his own experience of bringing the non-representational qualities of performance into his research through experimental writing, 'For me, this is not about writing performance (trying, with language more attuned to the emergent and the indiscernible viscerality of being, to

apprehend and share a singular, present happening to those who are absent) but about the performance of writing archived in the written document. This performance is about folding past and future into the present; or rather what, for me, it should try and do is present the real that is equally virtual and actual, equally imagined and physically manifest; it is then less agitated by realism'.

The performance writing is supplemented with visual research in the form of images and photographs. The visual material is not presented as evidence and will not be addressed in the text. The visual material is intended to work in dialogue with, or against, the performance text to provide a different, but equally valid, form of knowing. As with the text, the images were not chosen as documentation but to further develop the montage of thought images. For example, the images accompanying the text in Practice Insert 3, 'The Manvers Main Complex', lack the clarity or focus, representing the lack of precision of memory that was an important quality of the event.

The practice inserts aim to maintain within the research, qualities of experience that cannot be expressed or would be lost, through more objective analytical representational practices.

Practice inserts are presented in landscape format and use courier typeface to avoid confusion with the empirical chapters. Practice inserts are placed at the start of chapter 4, 5 and 6.

1.4 Research Questions

The overall question raised by this research is; What can a psychogeographical art practice reveal about the production of the digital expanded space in East London?

The question has two distinct aims. The first is to discover new knowledge about East London and the impact of 'the digital' on the production of space. The second is to develop new knowledge about using a psychogeographical art practice within digital cities research. It aims to discover what kind of knowledge a psychogeographical inspired art practice can produce and if its practices can be expanded to focus on digital aspects of the city.

The core research question is approached through three sub-questions which structure the thesis.

> 1) What can a psychogeographical art practice reveal about how spatial subjectivities are produced in the digitally expanded city?

2) What can a psychogeographical art practice reveal about the role infrastructure plays in the production of the digital expanded space of East London?

3) What can psychogeography reveal about what happens to digital representations of space when they become part of the lived experience of space?

Each one of these questions makes a different cut into the geography of East London, approaching it from a different perspective. The first question aims to gain insight into how people socially construct a personal understanding of East London and the role digital technologies play within this. It is answered in chapter 4. The second question, answered in chapter 5, focuses on the materiality of digital infrastructures and the impact they have on the experience of East London. The final question focuses directly on digital representations of space, for example, what happens to the fixed representations of the streets presented in Google street view when they are collectively experienced through their use. This is answered in chapter 6.

One final sub-question asks; What are the critical and philosophical implications for future ubiquitous and mobile computing research raised by the findings of a digitally expanded psychogeographical art practice? It aims to leverage the critical aspects of psychogeographical practices to focus on ubiquitous and mobile computing and the impact it has on city space.

In summary, the overall aim of the thesis is to investigate whether the knowledge that emerges from psychogeography's creative practices can inform and enhance a critical understanding of the impact of ubiquitous and mobile computing in East London.

1.5 Thesis Outline

This thesis has been structured into seven chapters. An overview of each chapter is presented below.

Chapter 2: Literature Review

The literature review defines 'the digital' in relation to city space and charts the key academic debates within digital cities literature. It then outlines how psychogeography developed its conceptual formulation within the post-war avant-garde milieu of the Situationist International, and how the ideas of the Situationists directly influenced early media art

practitioners, playing a seminal role in the development of locative media. It describes how the influence of psychogeography and the conceptual framing of artists' locative media projects have brought its practices to the interest of some HCI researchers. It also explores how the cultural turn in the discipline of geography has created academic interest in the potential of its practices to develop a critical spatial understanding of urban space. It highlights the common ground between the theories and practices of psychogeography and key points of Dourish's (2011) call to reimagine ubicomp research.

Chapter 3: Methods

In this chapter, I outline how an original psychogeographical art practice was developed and executed. The chapter is divided into two sections: 1) Methodology, 2) Research in Practice.

The methodology section sets out the techniques used to carry out the research. It describes Dewsbury's (2010), 'Performative, non-representational, and affect-based research' methodology and justifies why this was selected to research the digitally expanded city using a psychogeographically-inspired art practice.

The Research design section provides an overview of how the work was carried out. It documents four performance walking events, known as drifts, carried out to form the empirical ground for the research. The drifts themselves take the form of performative explorations of East London, focusing on the way digital technology has transformed the space of the city and encouraging participants to perform, critique, and re-imagine the city from different perspectives. It is through creating scenarios that encourage participants to reimagine the city, that the research develops an understanding of the process through which space is socially brought into being, developing a better understanding of the role digital technology plays within this process. Four drifts were organised to understand the practices through which space is socially constructed and the role ubiquitous and mobile computing played within this.

Chapter 4: Virtual Space

Chapter 4 focuses on how people construct an understanding of the city. It analyses the findings of the first drift, 'In The Cleansed Spaces the Wild Flowers Did Grow'. The drift focused on the general ambience and social and political background of Hackney Central. It took seriously the argument that space and spatiality is always already 'marked by circuits of digitality' that are themselves irreducible to digital systems (Ash et al., 2018). This drift

helped develop an understanding of how spatial subjectivities are produced in practice and answerd the research question; What can a psychogeographical art practice reveal about how spatial subjectivities are produced in the digitally expanded city?

Chapter 5: Actual Space

Chapter 5 focuses on the materiality of digital infrastructure. It analyses the findings of two separate drifts; 1) Invisible Geographies, 2) Searching for the Cloud.

Invisible Geographies, made use of radiofrequency (RF) receivers to convert the machine-to-machine communications of digital technologies into sound. The drift brought the attention of the participants to the more-than-human geographies of digital communications networks. The Invisible Geographies drift revealed the usually inaccessible unique spatial qualities of ubiquitous and mobile technologies.

Searching for the Cloud, continued the investigation into the materiality of digital infrastructure through a drift that sought the physical sites that enable cloud computing. This drift followed the route of underground fibre-optic cables to link seven of the key sites in the London Internet Exchange that enables London's internet, connecting it globally.

The two drifts were combined to answer the research question; What can a psychogeographical art practice reveal about the role infrastructure plays in the production of the digital expanded space of East London?

Chapter 6: Potential Space

Chapter 6 focuses on digital representational practices. It analyses the findings of the 'Manvers Main Complex' digital drift.

The Manvers Main Complex was a performance event which used Google maps as the site for a digital drift to investigate what happens when Google maps representational practices become socially and physically situated through collaborative practices. This chapter answers the research question; What can psychogeography reveal about what happens to digital representations of space when they become part of the lived experience of space?

Chapter 7: Conclusion

The conclusion provides an overview of the research project. It summarises the findings set out in chapters 4, 5 and 6 and brings together all four drifts to present three overarching

contributions. The contribution takes three distinct forms: 1) A framework and lexicon to rethink spatial production in the digitally expanded city; 2) A new understanding of the impact of ubiquitous and mobile computing on the experience of East London, and 3) An understanding of the kinds of knowledge a psychogeographical art practice can produce with a focus on the critical and philosophical implications for future ubiquitous and mobile computing.

It concludes by suggesting further refinements to develop digital psychogeography and outlines future work.

Appendix 1: outlines exhibitions that complement this research project.

2 Literature Review

In this chapter, I provide an overview of the theoretical approaches I draw on within this thesis. The core aims of this thesis are to investigate the role digital technology plays in the production of space in East London through the development of a psychogeographically influenced art practice and to discover whether the knowledge produced from psychogeography's creative practices can critically inform research within the fields of digital cities and ubiquitous and mobile computing. The review will present the wider academic debates concerning the digitally expanded city and ubicomp, and then turn to the distinct history and practices of psychogeography, from its origin within the avant-garde art milieu of the Situationist International to its influence on locative media, in order to suggest areas where psychogeography could be expanded to address concerns that relate to the rise of digital cities and ubicomp research.

I will draw on literature from three core areas, digital cities, ubiquitous computing and psychogeography. Digital cities are understood as the object of study, which will be approached through a psychogeographically-inspired art practice to contribute to the interdisciplinary fields of ubiquitous computing, cultural geography and fine art.

In the first section of this chapter, I provide an overview of the current literature on digital cities, defining the term 'digital' and what it means when used as a prefix to the term 'cities'. The majority of this literature comes from the field of cultural geography, which has approached the digitally expanded city from multiple perspectives. Much of the early work in this field conceptualised digital space as an alternative space to the everyday space of the city; later work focused on the complex entanglement of digital technology and the production of urban space. I will concentrate predominantly on the latter.

Shifting perspective from the digitally expanded city, Section 2 of this chapter focuses on the disciplinary interests of ubiquitous computing. In this section, I review Paul Dourish's, (2011), call to reimagine ubicomp research. I provide an overview of his key argument to highlight both the limitations of current ubicomp research, but more specifically to find potential key areas of common ground with spatial research within the areas of cultural geography and fine art performance.

I then turn to psychogeography. In Section 3, I give a brief history of psychogeography from its origins in the avant-garde art milieu of late 1950/60s Paris to its growing interest amongst researchers in the fields of HCI and cultural geography. This section asks whether

psychogeography's performative interventions into city space can help to develop an embodied and critical understanding of the digitally expanded city.

I conclude the chapter by outlining the points of intersection between psychogeography, ubiquitous computing and the digitally expanded city that inform my interdisciplinary approach to research.

2.1 The Digital Expanded City

Cities such as London are experiencing increased digital expansion, through the use of both smartphones and environmentally situated software and data capture devices (Kitchin and Dodge, 2011). Numerous technologies can now be found within London that disrupt the separation between the physical world and the digital realm: between physical objects and their representation in the digital field as data. There is a growing consensus between disciplines that digital technologies and the physical space of cities have converged. This process is variously referred to as pervasive computing (Hansmann, 2003), the Internet of Things (IoT) (Ashton, 2009), 'everyware' (Greenfield, 2006), and ubiquitous computing (Weiser, 1991; Poslad, 2011).

Ubiquitous computing (ubicomp) is a vision for computer systems to infuse the physical world of humans and social environments. It is concerned with making computing more physical, in the sense of developing a wide variety of computer devices that can be deployed in the physical environment. Ubicomp describes a disparate collection of technologies that shift the computing paradigm away from the two-dimensional world of screens and into the third dimension of the physical world. It describes a world increasingly instrumentalised and populated by embedded context-aware sensor-based and control devices. The combination of ubiquitous computing and mobile computing is creating a profound transformation in the way the space of the city is perceived, experienced and understood. In this section, I will frame my research through a review of the literature on digital cities and define the 'digital expanded city'.

Let's start with the lowest common denominator, zeroes and ones. What does it mean for a city to be digital? How can a building, a street or a town centre be said to be 'digital'?

Ash, Kitchin and Leszczynski (2018) have suggested taking a broad notion of 'the digital', extending it beyond computational technologies to encompass ontics, aesthetics, logic and discourse. The term 'digital' has its origins in the representation and storage of information in the form of binary signals using a physical quality such as voltage or magnetic polarisation. The ontic understanding of the digital is at the root of these physical qualities. Digital systems

translate all input into binary structures of 0s and 1s, which can then be stored, transferred, or manipulated at the level of numbers, or 'digits' (Lunenfeld, 2000, xv). It is the capacity of the electronic computer to encode a vast range of information digitally that has given it such a central place within contemporary culture. As all manner of representational systems are recast as digital information, they can all be stored, accessed, and controlled by the same equipment (Lunenfeld, 2000, p. 42). Ontics simultaneously emphasises an understanding of digitality as comprised of material digital objects: the hardware, software, devices, content, code, and algorithms that underwrite access to digital phenomena and mediations, which comprise the artefacts of our digital praxes, and which structure our experience of digitality. (Ash et al., 2019, p. 3). Ontics describes the software, devices and infrastructure that underlie digital processes and practices.

Lunenfeld (2000) emphasises that the digital is not just a technical quality. Using the example of photography and telephony he highlights how the digital is also an aesthetic quality. The conversion between analogue and digital produces aesthetic qualities beyond the technical; it alters how things look and feel. A photo that has been produced using a digital technique, rather than an analogue one, can be said to be a digital photograph. The term digital slips from its ontic tethering to describe the aesthetics and artefacts of digital processes. Digital software and hardware are now used throughout design, including architecture, vehicle design and urban planning. Digital technologies and techniques bring new possibilities and aesthetics to design, directly influencing the look and feel of city space. Digitality, then, is also an aesthetics, capturing the pervasiveness of digital technologies and shaping how we understand and experience space and spatiality (socio-spatial relations) as always already 'marked by circuits of digitality' that are themselves irreducible to digital systems (Ash et al., 2018). Aesthetics asks us to consider how digital technologies alter how the city looks and feels and the spatial understandings and imaginaries this inspires. Murray (2008, p. 40) argues that the digital has simply become too entangled with culture for it to be dislodged entirely and identified discretely. Therefore, digital aesthetics can be understood as the everyday feeling and understanding that is inspired by contemporary urban space.

As ubiquitous computing is entangled with the fabric of everyday life (Weiser, 1991) it not only influences how urban space is felt and understood, it also impacts on the structure and ordering, the quotidian rhythms (Lefebvre, 2004), time (Franklin, 2015, p.106), flows and spatial configurations. Digital logics come to play a role in structuring the space-time of everyday life. Digital logics can be shown to function at multiple levels, from a grand scale, such as the flows of goods involved in global supply chains, to the mundane, such as ordering a pizza. For instance, the order in which results appear in response to a Google Maps query for 'pizza' shapes consumption patterns by directing people to establishments that appear

nearer the top of the results chain. Results of searches conducted in June 2006 favoured national pizza chains over local restaurants, therefore promoting one set of consumption patterns over another, with the potential for restructuring local business (Zook & Graham, 2007a). A similar example is the shift to online shopping and the spatial impact these practices have on traditional retail practices. Such digital logics subtly alter the rhythm, pace, sense of time and spatial structuring of the city.

'The digital', therefore, when placed before the term 'city', refers to the ontic materialities of digital technologies, the aesthetic qualities the digital process brings into being and the reordering of the space-time of everyday life that results from our spatial engagement with digital logics. Ash et al. (2018) suggest we add to that list the digital discourses which actively promote, enable, secure, and materially sustain the increasing reach of digital technologies. Discourse here is understood in Foucauldian terms as the narratives, cultural myths, ideologies or unacknowledged assumptions that inform and impart direction to the micro-practices of everyday life, as well as influencing wider social goals.

An initial approach to thinking about the relationship between space and digital media was the idea of an alternative digital space parallel to the everyday space of the city. This idea was particularly popularised through the spatial imaginaries of science fiction writers and gamers. In his widely acclaimed 1992 novel *Snow crash*, Stephenson imagined a day when we would log on to a 3D virtual space via the Internet, travel about in it, and conduct business and other important parts of our daily routines in it (Ludlow and Mark, 2007, p. 2). William Gibson is credited with coining the term 'cyberspace' in his 1982 short story 'Burning Chrome' and the 1984 novel *Neuromancer*. De Souza e Silva (2006) claims that the concept of cyberspace applied to the internet was responsible first for our view of the physical and the digital as disconnected spaces, and second for our emphasis on the nodes of the network instead of its spatial structure, and finally for the utopian view of a future in which social spaces would emerge, mostly online. The space of digital technology was conceptualised as the disembodied virtual space of the internet or virtual reality. A communication space (Healey, White, Eshghi et al., 2008) of multiplayer real-time virtual worlds, chat rooms and social media platforms. At the height of its popularity in the mid-late 2000s, the virtual social environment Second Life was championed in popular discourse as an exemplar of the digital as a separate sphere of intimacy, dis/embodiment, and sociality, to which users could escape by animating a virtual avatar and leaving the trappings of the material world behind (Johnson, 2007). As Ludlow and Mark (2007, p. 258) describe,

> For two and a half years I watched Second Life residents work like dogs, often without remuneration, to build the wonderful mind-blowing place that it is today. All

> forms of fantastic structures and vehicles emerged in the space, from psychedelic cities to dark medieval fortresses to delicate gravity-defying elven castles. Artificial life forms appeared, reproduced and evolved in gorgeous gardens, while the skies were dotted by magnificent and elegant otherworldly flying machines. Virtual sporting events ranged from elven archery tournaments to giant snail races (Ludlow and Mark, 2007, p.258).

The introduction of internet-enabled mobile phones complicated this clear separation that was believed to exist between digital and physical space. De Souza e Silva (2006) argued that mobile phones transgress this traditional relationship with the internet because they are able to embed the internet in public spaces. She suggested that every shift of interface transforms not only the social relationships it mediates but also the spaces in which it is embedded. In other words, hybrid spaces were formed through the situated interaction between digital and physical space. Mobile internet brought cyberspace directly into contact with urban space. Hybrid spaces are theorised to be constituted by the enmeshing of two distinct realms of space and spatiality: digital (or virtual) spaces and real (physical, material, and/or actual) spaces (Ash et al., 2019, p. 15). The rise of location-aware mobile devices eroded the disconnection between physical and digital spaces (de Souza e Silva, 2006). Hybrid space remains a useful tool for considering practices that make use of geospatial data and information such as geotagging, locative media (Tuters, 2004a; Chang and Goodman, 2006; Pinder, 2013), geospatial audio (Freeman, DiSalvo, Nitsche, Garrett, 2012), mobile storytelling (Farman, 2015) and augmented reality (Graham et al., 2013, p. 465).

Hybrid space demands the acceptance of the binary opposition between real physical space and an immaterial digital space which hybridity unites. Such an ontological binary is challenged by research that exposes that digital spaces, rather than being immaterial, are underpinned by a vast material infrastructure (Malecki, 2002; Zook, 2005; Blum, 2012; Starosielski, 2015). Metaphors such as ‘cyberspace’ and ‘the cloud’ are grounded in these projects that explore and map the materiality of digital infrastructure at a local and global level. Blum (2012), for example, conducted a road trip in search of the internet, following the cable from this own home on a journey to remote data centres, internet exchanges and ships laying fibre-optic cables deep under the ocean to link continents. Blum concludes his road trip by stating that ‘What I understood when I arrived home was that the Internet wasn’t a physical world or a virtual world, but a human world. The Internet’s physical infrastructure has many centres, but from a certain vantage point there is really only one: You. Me. The lowercase i. Wherever I am, and wherever you are’ (Blum, 2012) This sentiment reaffirms that social practice is at the centre of spatial production. But in a world that is increasingly being instrumentalised by sensor-based and control devices, the social practices of humans

are not the only actors with agency in the production of space. Ubiquitous computing introduces the transformative potential of code, algorithms and artificial intelligence directly into city space.

Kitchin and Dodge (2011) theorised the spatialities produced by the ubiquitous presence of code and software in everyday spaces. They described two key ways in which code and software instrumentalise spatial production. They named them coded spaces and code/space.

Coded spaces are defined as spaces where software makes a difference to the transduction of spatiality but the relationship between code and space is not mutually constituted (Kitchin & Dodge, 2011, p. 18). Coded spaces describe spaces in which code plays an important role in how they are produced and operate. However, digital processes can be replaced by analogue systems in the event of a breakdown. For example, at a supermarket checkout the scanning of barcodes and the automatic calculation of costs enables the speedy processing of customers and maintains the flow through the shop. If the automatic till was to break down, the shop could still resort to manual checkout procedures to maintain the functioning of the retail space.

Code/space occurs when software and the spatiality of everyday life become mutually constituted: that is, produced through one another (Kitchin & Dodge, 2011, p. 18). Code/space is a space in which the functioning of code is essential. The failure of the code results in a breakdown in socio-spatial relations. The spaces of air travel are quintessential code/spaces. A failure of digital technologies – biometrics, passport verification, body and luggage scanners – would result in the failure of the space. An airport would cease to function as such; the sociality of the space – people moving between places – would similarly fail. (Ash et al., 2019, p. 18).

The theorisation of code/space also brought an interest in the philosophical concepts of ontogenesis and transduction, originally developed by Guilbert Simondon, into the language of digital cities research. Ontogenesis is an interest in how something comes to be. Ontogenesis is often contrasted with ontology, which is an interest in what something is. This is important to the study of digital cities because it shifts the debate from the analysis of the unity of space to the unity of becoming space. Transduction denotes the process – physical, biological, mental or social – through which space is set into motion and produced. Coded spaces and code/space describe an ontogenetic process through which space is transduced through code.

Leszczynski (2015) has recently expanded on the ontogenetic theorisation of code/space in the context of natively digital media by proposing mediation as a conceptual framework for

understanding the multiple yet contingent coming-together of technology, people, and place and space that are productive of our quotidian lived realities. (Ash et al., 2019, p. 18). Mediation understands space as having agency in and of itself and places it in a productive relationship with social relations and technology. From the perspective of mediation, space is shown to play an active role in forming and shaping the digital. Space shapes the digital and is shaped by the digital, but such interdependencies also shape, and are shaped by, social relations. The digital city is articulated as the effect of the multiple, contingent, never complete coming-together of persons, technical presences (spatial media), and space/place (Leszczynski, 2015).

Arguments have been made for research that moves beyond human interaction to explore more-than-human spatialities. Ash (2013) asks us to think about the ways in which technical objects relate to one another and to human beings outside of human consciousness or intentionality. He describes the invisible machine-to-machine interaction hidden within what Latour (1999, p. 304) calls 'black-boxed technologies' that sink into the background of human perception. He suggests that technical objects relate to one another through 'perturbations', which are active in the production of atmospheres (a term that refers to the circulation of perturbations to produce space times local to technical objects) (Ash, 2013). Machine-to-machine interactions outside of human perception create atmospheres beyond their technical function. These atmospheres are real moments of space-time that shape the capacities and conduct of both humans and non-humans. The variation in levels of network connectivity is a good example. Mobile devices regularly check in with cell towers when our devices are not being used. As we move around the city there is a constant machine-to-machine interaction to ensure our mobile devices remain connected to the network. Some areas have lower connectivity, or none at all. This is a failure of the machine-to-machine interaction. However, it produces a perceptible spatial atmosphere in particular locations. People respond to these geographies, moving to positions or locations where they receive better connectivity. To get a better signal, this can lead to people grouping in one area rather than another, changing the general atmosphere of the location. More-than-human geographies decentre the human-centric perspectives of spatiality, exposing the multiple complex of actors involved in the production of the digitally expanded city.

In summary 'the digital' pertains to a set of complex features and procedures that include the ontic materialities of digital technology, aesthetic qualities felt as atmospheres, logics in which code transduces the rhythm and flow of the city and discourse that stabilises and destabilises power and control through digital means. Digital spatial technologies are expanding the space of the city. The relationship between digital technology and the city is a complex, more-than-human one in which the convergence of digital technology and the city

can be shown to have expanded not just the space of the city but what the space of the city is. I refer to this phenomenon as the digitally expanded city.

The digitally expanded city cannot be understood through a study of a single technology, city or people: it is only by researching the dynamic relationship between these entities that an understanding of the digitally expanded city can emerge. The research carried out in this thesis focuses on how the digital expanded city shifts and shapes the way its inhabitants experience and perceive the city.

Paul Dourish (2011) has written an extensive critique of ubicomp research practices, and I review his key findings here to highlight potential key areas of common ground with spatial research within computer science.

2.2 Ubiquitous and mobile computing

Whilst solving technical problems will remain an essential aspect of ubicomp research, understanding the wider implications and consequences of ubicomp's deployment in the everyday life of cities beyond technical considerations is increasingly necessary in order to inform new approaches, produce new hypotheses and build on the collective knowledge within the discipline.

Dourish's 2004 book *Where the action is: the foundations of embodied interaction* had a profound impact on the development of real-world and embodied ubicomp research methods. It has had a foundational influence in shifting ubicomp research from a focus on lab-based design to one on how physical and social phenomena are performed within a real-world temporal and spatial environment. The book functions as a textbook for many carrying out real-world ubicomp research. However in his more recent book *Divining a digital future: mess and mythology in ubiquitous computing* he suggests that 'Ubicomp […] encompasses a wide range of disparate technological areas brought together by a common vision of computational resources deployed in real-time, real-world environments […] Realising, or at least moving toward, this common vision has necessitated a blending of disciplinary approaches from computer science and engineering with some social science perspectives and practices.' (Dourish & Bell, 2011, p. 61). Dourish critiques current ubicomp research, not to discredit or dismiss the work that has been carried out so far in the field, but rather in recognition of the fact that ubicomp itself has expanded beyond the confines of its own disciplinary boundaries, and calls to expand the research practices within the field to reflect this. I will review some of his key criticisms here in the interests of pointing out the limitations of current ubicomp research and finding common cause with cultural geography and fine art performance.

Implications for Technological Design: a False Claim to Objectivity

Dourish is particularly critical of the reduction of ubicomp research to its implications for technological design. He suggests that within ubicomp research there is a disciplinary pressure to narrow the focus to its implications for design and suggests that by relegating research 'to implications for technological design, ubicomp practitioners fail to capture the deeper value of ethnographic investigations, insights, and knowledge' (Dourish & Bell, 2011, p. 62). Dourish argues that this approach, defined by the researcher going out into the world, observing, returning and writing a report with a focus on directing the findings towards their implications for technological design, produces a limited form of knowledge and a false claim to objectivity. The writer of the report interprets the observed data from a situated and subjective technological design perspective that ultimately may miss fundamental forms of knowledge that can enhance the production of more grounded technologies. He states that 'If the interaction between people and computers – or between people through computers – is itself a domain of inquiry, then the call for ethnographic studies to deliver implications for design is somewhat disingenuous (Dourish, 2011, p.71)'. To emphasise his point he contrasts recent ubicomp research that focuses on mobility and mobile technologies with Nancy Munn's (1996) ethnographic study of the Warlpiri aboriginal people of central Australia. Dourish explains how, in Munn's study, the Warlpiri people recognise the concept of mobility and their own relationship to their environment in ways very different from the Western approaches to these concepts. Quoting Munn, he points out that 'The spatial model here is one of centres of ritual potency that resonate out into the environment […] and even Warlpiri "maps" of Warlpiri country, when they are drawn, are always partial, contextual, and transitory. This is not cartography as we would recognize it in the Western tradition. The model of place at work here is cultural and relational' (Dourish, 2011, p.82). What is of particular interest to Dourish is 'the fact that in Australia, two completely different systems of spatial knowledge production rub up against each other in troublesome ways' (Dourish, 2011, p.82). He concludes that within Munn's study the focus is on the experience of space:

> 'Space emerges as a relational, cultural object, and much of this cultural meaning – rootedness, morality, kinship, and responsibility – cannot be reduced to Cartesian coordinates or global positioning system (GPS) references […] This implies that technologies that seek to enhance, incorporate, or respond to the user experience of space may be limited by the representational schemes used to operationalize it. If the user experience of space is cultural rather than cartographic, then an alternative foundation for design presents itself'(Dourish, 2011, p.83).

One of the purposes for drawing on practices from cultural geography and art is to address this criticism by moving beyond fixed representational schemas and approaching urban space as culturally produced in practice.

Affective Computing

One recent development in ubicomp research is an interest in affect. Affect is the not yet fully conscious intensity that corresponds to the passage from perception to action. It corresponds with the aesthetic feelings produced by perception in the state prior to their recognition as emotion or mood, and the development of affective computing has refocused ubicomp research from cognition towards affective aspects of interaction. This has led to a broadening of the research and an attempt to pay greater attention to wider aspects of the embodied human experience in relation to computer interaction. To gain access to this wider emotional and pre-cognitive data, ubicomp researchers have incorporated a number of data-gathering strategies. These include the use of open-ended survey questions, self-reporting techniques and experience sampling methods. Dourish again uses the strategy of contrasting ubicomp research practices in the area of affective computing by looking at two non-HCI accounts of emotion, Catherine Lutz's study (1986, 1988) of everyday emotion in Micronesia and Lila Abu-Lughod's study (1986) of emotional expression among the Bedouin. What emerged from the ubicomp research into affect described by Dourish was an attempt to structure affective states into taxonomies. By identifying and developing taxonomies of human affective states, affective computing researchers are able to build systems that respond to users' emotional states. However, by setting up a comparison with the emotional ethnographies produced by Lutz and Abu-Lughod, Dourish suggests that within HCI ethnographies 'affect frequently appears in this research as a private experience, as something individual that is internal and closed off from the world'. (Dourish, 2011, p.75-76) This view of affect as a fixed and stable individual experience that can be isolated from the world and categorised into fixed and stable taxonomies contrasts sharply with the analysis of affect produced through the Lutz and Abu-Lughod studies. He argues that 'these accounts suggest that emotional expression is a point at which cultural values are expressed and performed. Rather than thinking of emotionality as being shaped by cultural variables, they hold that emotional performance is itself a site of cultural production […] Emotion is therefore interactional as opposed to representational (Dourish, 2011, p.79). For Dourish, this suggests that affective computing should be approached not from the perspective of fixed representations but rather through 'a non-representationalist stance – one that supports the enactment of emotional sociality rather than attempting to uncover the parameters of an emotional model that underlies and shapes human action (Dourish, 2011, p.79). This observation by Dourish has parallels within research within cultural geography which explores the affective geographies produced through performance

or walking techniques that focus on non-representational and more-than-representational knowledge, (for example, the feeling of a breeze, a warm glow of sunlight or the anxiety induced by an unfamiliar street) which have moved away from constructing fixed understandings of space in favour of experiential methods of studying affective landscapes (Wylie, 2002; McCormack, 2002; Sidaway, 2009). It also has a strong resonance with research that explores the digital city from the perspective of aesthetics and atmospheres (Ash, 2013) produced through the more-than-human geographies of technical objects reviewed in the previous section. As I will elaborate later in the thesis, psychogeography can be read as a precursor to the current interest in the aesthetic and affective geographies of cities.

Ubicomp's Spatial Representations

Dourish emphasises that ubicomp incorporates spatial representations, embedded within their hardware, software and algorithms, through the disciplinary logic of their production. He suggests that 'Computer scientists and technologies read environments as informative according to a set of understandings they have of the ways in which the world might be represented; computational representations are tools of the trade, and learning to be a computer scientist involves learning to encounter the world as amenable to those sorts of representations, as a world of iteration and recursion' (Brewer and Dourish, 2007). Representations embedded with ubicomp technologies can be seen as similar to traditional mapping practices, abstractions of the world in the form of data and processing which contain ideology. However, unlike mapping practices, ubicomp's spatial representations have received very little critical consideration, a gap in knowledge that this research starts to address through an engagement with critical cartography. Understanding that ubicomp developments involve a theoretical representation of the world which embeds cultural logics is an area that is central to the interdisciplinary nature of this research and developing a critical discursive field around ubicomp's representational practices is a central goal of the thesis.

Dourish concludes his critique by stating 'Clearly we believe that critical theory is at the core of a reimagined ubicomp. And there is much that could and should be interrogated, such as sites of technology consumption, actors, motivations, and technology itself, not to mention the politics of consumption, bodies, design, and production'. (Dourish, 2011, p.205) Critical theory that has developed to understand spatial practices within the area of performance and cultural geography is very well placed to be adapted to the critical analysis of ubicomp's spatial representational models and to play a key role in reimagining ubicomp research. My research draws from the interdisciplinary interest in the critical spatial theories of writers such

as Foucault, Lefebvre, de Certeau, Deleuze and Guattari and DeLanda, those of the Situationist International and those writing from a geographical perspective such as Doreen Massey, Nigel Thrift, Manuel Castells and David Harvey.

One important consequence of ubicomp's desire to become invisible is that it also renders power and control as invisible. It is therefore essential to take up the call 'to "read for theory" as much as for empirical evidence' (Dourish, 2011, pp. 74-75) so that issues of surveillance, power and control can be made visible and a fundamental part of the design process.

Mark Weiser is credited with instigating a shift towards ubiquitous computing with his 1991 paper 'Computers for the 21st century'. He wanted to build 'technology truer to the possibility of invisibility […]'(Weiser, 1993) However he also believed that 'to understand invisibility the humanities and social sciences are especially valuable, because they specialize in exposing the otherwise invisible' (Weiser, 1993).

The aim of ubiquitous and mobile computing is to embed computational devices into everyday environments, so that they can play an invisible yet active role in the life of the people who inhabit those environments. However, as Dourish has pointed out, the role of social science disciplines within ubicomp research has been predominantly limited to ethnographic evaluations of technologies and human-computer interaction, with a narrow focus on their implications for technological design.

The study of space, spatiality and cities is a relatively new area in the field of computer science; however, there are established bodies of knowledge in the fields of cultural geography and fine art performance. Dourish's key critical points contain many shared points of intersection, and can be seen as a shared common ground with current research practices in cultural geography, in particular digital cities research, more-than-representational theories (Lorimer, 2005) and creative research practices at the intersection of geography and art (Hawkins, 2011). What brings together Dourish's re-imagining of ubicomp research and critical spatial practice is a recognition that categories such as affect, space and time are not fixed categories, but are produced and performed. In order to identify which spaces and times are performed in ubiquitous computing, and the aesthetic affects and cultural logics they produce, an experimental form of research is required that disrupts the stability of everyday life to reveal the relational nature of digital technologies, cities and the bodies (Leszczynski, 2015) engaged in practice, and that can perform new forms of more-than-human (Ash, 2013) practices to reveal the atmospheres and aesthetics unique to ubiquitous computing.

To access the sort of knowledge that maintains the chaos and mess of the everyday experience necessary to develop an understanding of the complex forces and multiple

representations involved in the production of city space, many urbanists have looked to the experimental practices of artists and performers working directly with city space. These artistic practices create events that disrupt everyday experience, and through these acts of estrangement make explicit the performative nature of spatialisation and temporalisation, allowing a better understanding of the practices and processes that produce space. Those research practices most attuned to the more-than-representational approach advocated by Dourish are those that employ walking, running, exploring and mapping, using their own bodies as research instruments, opening themselves up to the affective geographies of city landscapes (Harkins, 2011).

Psychogeography is a walking technique that has received perhaps the most academic attention for its potential to be employed as a critical spatial practice. This thesis takes psychogeography as its starting point, exploring the unique knowledge its practices can reveal and purposefully developing new psychogeographically influenced techniques as a form of critical spatial practice that can be adapted and expanded as a method of gaining a critical understanding of the convergence of ubiquitous and mobile computing and the physical space of East London.

The following section provides a review of the literature in psychogeography, exploring its origins as an avant-garde art practice to its later adoption by academics researching a variety of fields concerned with the experience of the body in space, from geographers interested in urbanism to HCI researchers interested in locative media. It will conclude by highlighting key areas of common ground between psychogeography, cultural geography and a reimagined ubicomp research.

2.3 Psychogeography

In this section of this thesis, I will give an outline of the practice of psychogeography. It will start with a history of the practice as it emerged within avant-garde art; it will then look at the way psychogeography has emerged as a critical spatial practice within the area of cultural geography and highlight how psychogeography has been a conceptual driver in the development of locative media. It will explore how this media art focus brought it to the attention of some researchers working in the area of HCI and will highlight key areas of common ground between the practices of psychogeography, areas of interest in digital cities and Dourish's call to reimagine ubicomp research. The review will conclude by suggesting how the practice could be employed to investigate the way in which ubiquitous and mobile computing play a role in how people understand the city and gain an insight into how technology is playing a role in reconfiguring the space of the city.

The origins of the various practices that make up psychogeography's development can be traced back to figures as diverse as Walter Benjamin, Louis Aragon, André Breton, Charles Baudelaire, Arthur Rimbaud, Thomas De Quincey, Edgar Allan Poe, Daniel Defoe and, William Blake, and found particular resonance with the avant-garde milieu that gathered around movements such as dada and, in particular, the Surrealism. However, the actual term 'psychogeography' first appeared in the *Bulletin d'information de groupe français de l'international lettriste*, better known as *Potlatch* (Coverley, 2006, p.85). The Lettrist International was a collective of radical artists based in Paris between 1952 and 1957 that included figures such as Ivan Chcheglov, Gil Wolman and Guy Debord. As the Lettrist International merged to form the Situationist International (SI), Guy Debord gave psychogeography a more theoretical articulation, defining it in *Internationale situationniste* #1 as 'The study of the specific effects of the geographical environment, consciously organised or not, on the emotions and behaviour of individuals'(SI, 1981b). Psychogeography is the attempt to understand the affect that the built environment has on people's emotions and behaviour, and this is key to understanding the Situationist re-imagination of the city.

What emerges is an image of the city as a series of ambiences that can be studied: Debord described cities as having 'a psychogeographical relief, with constant currents, fixed points and vortexes which strongly discourage entry into or exit from certain zones' (SI, 1981b). Debord developed two useful tools to carry out this study, the *dérive* and the psychogeographical map. The *dérive*, translated as 'drift' in British psychogeography, was described as 'A mode of experimental behaviour linked to the conditions of urban society: a technique of transient passage through varied ambiences.' (SI, 1981b) In effect the drift is an

unstructured walk in which the walker breaks out of their usual routines and allows themselves to be guided by the particular emotions and ambiences of the built environment. The results of such a drift could then be used to produce a new form of cartography, the psychogeographical map, which rejects the fixed universalising view of traditional Cartesian mapping in favour of techniques that better reflect the affective and fragmented experience of being in the landscape.

Guy Debord and Asger Jorn gave an indication of how this new cartography might be expressed when they produced the 1956 *Guide psychogéographique de Paris* and the 1957 *Naked city* (Sadler, 1999). These maps attempted to represent the disorientation and fractured experience of their Paris *dérives* by scattering pieces of the map and linking them with military-style arrows.

Fundamental to these practices was a critical analysis of alienation. Marx, in his *Economic and philosophic manuscripts of 1844*, had highlighted the process of humans' alienation from the products of their own labour. In the post-war economic boom and reorganisation of Paris, the SI, together with other thinkers such as Henri Lefebvre, witnessed the expansion of alienation into everyday life. The sanitisation of urban space was a form of alienation of the city's inhabitants from the city streets, as Debord noted: 'The modern commodity had not yet shown what could be done to a street' (Debord, 1991). The Situationists represented the city as a site of contestation. The militaristic overtones of *Naked city* are not accidental. In the collective imagination of the Situationists, they were engaged in a battle against the alienating colonisation of the city streets. This battle was particularly apparent in the clearance and gentrification of the working-class districts of Paris. The battle against the alienation of the streets is the origin of the two strategies employed by the SI during this period of glorifying the old working-class areas of Paris, such as Les Halles, whilst constructing a 'Formula for a New Urbanism' and drawing up designs for a revolutionarily transformed Situationist city. Psychogeography emerges within this project as a practice of direct engagement with the city, through which the Situationists could challenge and critique the universalising representations of space produced by cartographers, urbanists and architects and make visible the ideologies they embody.

The Situationist International disbanded in 1972, and from that point their critique of modernism and their psychogeographical techniques of contestation have had a rhizomatic impact on both radical and popular culture. Greil Marcus, in his book *Lipstick traces* (2011) has exposed the influence of the Lettrists and Situationists' ideas on the development of punk, and Phil Baker's Secret City: psychogeography and the end of London charts the post-punk

reinvention in the literary circles of psychogeography. There is a wealth of writing on the reinterpretation of psychogeography by British literary figures such as Iain Sinclair, Tom Vague, Peter Aykyord, and Will Self, amongst others (Coverley, 2006; Bonnett, 2009; Baker, 2011; Luckhurst, 2011). Psychogeography has also entered academic discourse, making an impact on a number of important research areas such as literary theory (Baker, 2003; Chapman, 2006; Coverley, 2010; Keep, 2009), psychology (Bridger, 2012), media art (Tuters, 2004a; Chang and Goodman 2006; Pinder, 2013), performance research (Smith, 2010, 2015), architecture (Borden, 1999) and cultural geography (Bonnett, 1992, 2009, 2015; Pinder, 1996, 2000, 2005; Wood, 2010; Hawkins, 2011). It has also attracted the interest of HCI researchers interested in areas of computer science that bring together digital technology and the physical body in space. Examples include work on locative media (Tuters, 2004a; Chang and Goodman, 2006), virtual reality (Elias, 2010), game design (Flanagan, 2009) and mobile interface theory (Farman, 2002, p.50).

This review will focus on the key areas relevant to the research aims of the thesis, focusing on cultural geography's discourse around psychogeography as a critical spatial practice before looking at its influence on locative media and the possibilities of researching whether its creative practices can critically inform and enhance the production of ubiquitous and mobile computing research.

Psychogeography has entered a much wider academic discourse within spatial theory, prompted in part by a cultural turn within the discourses of both architecture and geography. Jane Rendell states that 'My hope is that the work of artists critically engaging with sites outside the gallery can help develop an equally influential terrain of spatial understanding through critical practice, as well as critique through spatial practice' (Rendell, 2008), and Harriet Hawkins (2012) notes that 'geographers' research on the sensuous, psychic and subversive urban engagements of the Situationist International, and their legacies, offer early indications of art's value in this area' (Bonnett, 1992; Pinder, 2001). The interest in the potential of artistic practice in general, and neo-psychogeographical experiments in particular, to function as critical spatial practices opened these marginal avant-garde endeavours to wider academic attention. As Pinder articulates, there has been

> […] a developing concern within academic, artistic and activist circles with exploring critically the cultural geographies of cities. This includes practices of studying, representing and telling stories about cities; it also involves ways of sensing, feeling and experiencing their spaces differently, and with contesting 'proper' orderings of space to allow something 'other' to emerge. Characterizing this experimentation

> within academia is not only interdisciplinarity or transdisciplinarity, in recognition that understanding cities necessarily requires diverse perspectives and cannot be the province of any one discipline alone. Also important is a growing dialogue and interconnection between academia, artists, cultural workers and activists, and between critical and creative practices. The search for tactics, spatial practices and modes of expression with which to explore urban culture is leading to an increasing turn to work traditionally associated with the creative and performing arts and with the inventiveness of activist groups, and now permeating all sorts of critical endeavour. (Pinder, 2005, p.387)

The dialogue between academic researchers and artists carrying out neo-psychogeography has been reciprocal, and practitioners have developed the critical and theoretical aspect of their practice, sometimes blending Situationist theory and practice with a wider range of critical perspectives imported from broader philosophical and academic discourse on urban space. Particular influential examples include the integration of feminism (Bridger, 2013), the philosophy of Deleuze and Guattari (Richardson, 2015; Powell, 2009) and, via Mark Fisher's interpretation, Derrida's concept of hauntology. I will give a brief overview of two of these developments, schizocartography and hauntology, as some of their reformulation of the elements of psychogeography will be adopted in the drifts developed within this thesis.

Tina Richardson has defined her own branch of psychogeography, blending aspects of the Situationists' original concept with the philosophical work of Félix Guattari to form a spatial walking practice that attempts to highlight the 'ideological processes that are in operation within a terrain'. She defines her practice as schizocartography, stating that

> Schizocartography offers a method of cartography that questions dominant power structures and at the same time enables subjective voices to appear from underlying postmodern topographies. Schizocartography is the process and output of a psychogeography of particular spaces that have been co-opted by various capitalist-oriented operations, routines or procedures. It attempts to reveal the aesthetic and ideological contradictions that appear in urban space whilst simultaneously reclaiming the subjective individuals by enabling new models of creative expression. Schizocartography challenges antiproduction, the homogenising character of overriding forms that work toward silencing heterogeneous voices (Richardson, 2015)

Richardson articulates two developments within psychogeography that directly relate to the research questions in my thesis. The first is a recognition that psychogeography's stated aim of understanding the effect that the built environment has on people's emotions and behaviour, while coming from diferant ideological perspectives, has close parallels with Deleuze and Guattari's philosophical formulation of affect, which presages affective geography and computer science's turn to affective computing. The second development Richardson suggests is the inclusion within psychogeographic practices of a vertical reading of a site, in the form of archival, historical and theoretical research alongside and in dialogue with a parallel reading through the practice of the drift. This development recognizes the sometimes invisible presence of past events within a reading of a site, and has parallels with hauntology.

Hawkins has observed that 'alongside studies of urban politics and experience the legacies of SI work has also offered geographers the means to extend theories of history and memory through the study of artistic explorations of the "ghosts" of cities' (Hawkins, 2011). History and memory is an important aspect of the contemporary debates around psychogeography, and is particularly relevant to later artistic and literary reinterpretations such as those of Iain Sinclair (1997, 1998) and the films of Patrick Keiller (1994, 1997), and has more recently developed its own radical potential through the practice of a pyschogeographic variant of hauntology, most vocally articulated by the psychogeographer and artist Laura Grace Ford (formally known as Laura Oldfield Ford).

Hauntology has its origins in the book *Specters of Marx*, by the French philosopher Jacques Derrida. In Derrida's work, 'hauntology' was a play on the term 'ontology'. As Mark Fisher explains, 'The concept of hauntology was in part a restatement of the key deconstructive claim that "being" is not equivalent to presence. Since there is no point of pure origin, only the time of the "always-already", then haunting is the state proper to being as such' (Fisher, 2013)

> Ghosts arrive from the past and appear in the present. However, the ghost cannot be properly said to belong to the past […] Does then the "historical" person who is identified with the ghost properly belong to the present? Surely not, as the idea of a return from death fractures all traditional conceptions of temporality. The temporality to which the ghost is subject is therefore paradoxical, at once they "return" and make their apparitional debut. Derrida has been pleased to call this dual movement of return and inauguration a "hauntology", a coinage that suggests a spectrally deferred

> non-origin within grounding metaphysical terms such as history and identity. (Buse and Scott, 1999, p.11).

From a psychogeographical perspective, spaces can be seen as haunted by past events and memories. More significantly, they can be seen as haunted by the lost potentials of alternative futures. Artists such as Oldfield Ford articulate through their work the lost potential within modernist projects such as London's post-war social housing developments. This should not be confused with nostalgia for the buildings themselves but seen as an attempt to position the utopian ideals of such projects in the present.

I will now look at the way early media artists were influenced by the theories of psychogeography and how this has led to the adoption of psychogeography by many researchers interested in HCI.

Many early media artists came to incorporate digital media, in particular the early internet, into their arts practices as a subversive strategy to move beyond gallery-based art and the corporate market that supported it. In many cases they were driven by a radical conceptualism that had its origins in the avant-garde of previous generations, and the Situationist International was particularly influential. Amy J. Elias (2010) points out how 'theoretical advocates and devotees of the theoretical aspects of the internet and Web 2.0 often draw correspondences between the SI's redefinition of city space and the redefinition of cosmopolitan space […] taking place in virtual realities'. The concepts of psychogeography became reworked in early internet art and new media through projects such as socialfiction.org's project *.walk*. The media theorist Florian Cramer described this as a 'psychogeographic computer', operated by pedestrians who walk through street grids like electrons flowing through the gates of computer chips. The .walk computer can execute simple programme code such as the following:

```
// Classic .walk
Repeat
{
1 st street left
2 nd street right
2 nd street left
}
```

(Cramer, 2005).

Other early examples by an internet pioneer who fused concepts of psychogeography and the internet were Heath Bunting's 1996 *Project X* and his *Psychogeography walk trampoline*, Broadway, Nottingham.[3] In *Project X* Bunting chalked URLs around Bristol which, if followed, led to an online form that encouraged the participant to give feedback about the location where they originally saw the chalked URL.
These projects represent some of the ways psychogeography transmigrated from the literature of the Situationist International and into the digital space of the internet through the work of early pioneers of media art. However, psychogeography had its biggest impact on those media artists who started to incorporate the physical space of the city into their projects, moving beyond the confines of the internet and developing locative media projects.

Locative media is the use by artists of location-based technology to create geo-triggered artworks. In locative media physical location becomes a new parameter in the production of an artwork, opening up the possibility of creating site-specific artwork as physical spaces are overlaid with new meaning. Artists make use of the historical, social and political history of a physical space to create works that, through a process of montage of media and physical location, fundamentally alter how a site is viewed or perceived, in the same way that a soundtrack creates a montage with the images of a film to create new meaning that was present in neither the sound nor the images alone.

The foyer of a multinational corporation became the site of a subversive opera in John Jordan and James Marriott's operatic audio tour set in London's financial district (Pinder, 2008). Physical location becomes a new parameter in the production of an audio work, creating the potential for artists to compose geospatially aware audio compositions, such as the experiments carried out by UrbanRemix (Freeman, DiSalvo, Nitsche, Garrett, 2012) or Bluebrain's *National mall* project (Behrendt, 2012).

The origins of locative media can be traced at least as far back as Ben Russell's (1999) *Headmap manifesto*. In a 2002 performance collective Blast Theory presented *Can you see me now?'* which used GPS-enabled mobile devices to turn the city into a game board, for which they were awarded the prestigious 2003 Prix Ars Electronica Golden Nica for Interactive Art (Tuters, 2012). Karlis Kalnins gave the genre the name 'locative media' during the Art + Communication Festival in Riga, Latvia, in 2003 (Wilken, 2012). In 2004 the transmediale festival in Berlin organised a conference panel discussion entitled 'Mobilotopia', which recognised that 'artists are exploring the emerging field of "Locative

[3] Bunting, H. (1996). Psychogeography walk, Trampoline, Broadway, Nottingham. [online] Available at: http://status.irational.org/nottingham_high_street_walk/ [Accessed 7 June. 2018].

Media" which combine the mobility of the device with the fact that the mobile user can be tracked and located'[4]. In the same year, Futuresonic, a festival exploring cutting-edge developments in electronic music and digital media held at the Urbis museum in Manchester, organised the exhibition 'Mobile Connections'. Curated by Drew Hemment, this was the first major exhibition focused on locative arts. The 'Mobile Connections' exhibition featured work such as *InterUrban* by Jeff Knowlton, Naomi Spellman and Jeremy Hight and *Aura* by Steve Symons. *InterUrban* provided the audience with a location-based interactive narrative set in the streets of Manchester, whilst Aura presented a virtual sound environment in Cathedral Gardens. Locative media continued to proliferate over the next few years; Esther Polak was awarded the 2005 Golden Nica for Interactive Art at Ars Electronica for the locative project *MILK* (Zeffiro, 2012).

What is most important to note is that many of the pioneers of locative media were influenced by the theories and writing of the Situationist International, and particularly the discourse around psychogeography and the theory of the *dérive* (drift), and this fascination with psychogeography is also reflected in much of the academic discourse and critical discussion on locative media (Tuters, 2004a; Chang and Goodman, 2006; Pinder, 2013). Nato Thompson describes a GPS-guided bus tour with synced sound organised by e-Xplo: 'as an auditory environment, the tour is meant to disrupt assumptions about place in order to insert a poetic read on site. Like Debord's *Naked city*, this montage of sound and speed allows one to restructure the given map of a city' (Thompson, 2008).

As noted by both Zeffiro (2012), and Tuters (2012), the interest in these projects started to dwindle with the introduction of the iPhone in 2009. Although the first GPS-enabled phone was the Benefon Track, released in 1995, the iPhone combined GPS with the ability to deliver high-quality video, audio, and text. Whereas the pioneers of locative media had created their own systems to enable their projects, the iPhone and later smartphones represented the growing commercialism of locative media, destroying the utopianism of the 2004 transmediale conference. This commercialisation of the technology, combined with a growing criticism, influenced by Holmes (2004), that read locative media as the 'avant-garde of the ''society of control''' diminished the appeal of locative media for new artists, and by 2011 a contributor to the influential art magazine *frieze* could write: 'Locative media remained the stuff of demos and art-technology festivals until 2008 when Apple released the GPS-enabled iPhone 3G. Paradoxically, the mass realisation of locative media seems to have taken the wind out of its sails as an art form' (Cornell and Varnelis, 2011).

[4] Mobilotopia panel event, transmedialie. (2004) Available at: https://transmediale.de/content/mobilotopia [Accessed 17th July 2019]

As artists retreated from the forefront of locative media development, the psychogeographically-inspired art form was increasingly coming to the interest of HCI researches and developers interested in game design (Flanagan, 2009; Farman, 2009), mixed reality (Benford and Giannachi, 2011) and mobile interface theory (Farman, 2012; Farman, 2013). A number of academic papers referencing psychogeography were presented at HCI conferences (Leahu, Thom-Santelli, Pederson and Sengers, 2008; Shepley and Rowland, 2015; Kelly, Reeder, Wang and Morse, 2009; Farman, 2009).

The appeal of the psychogeographic drift for those researching locative media is that 'In adopting the mapping-while-wandering tactics of the dérive, tracing-based locative media suggests that we can re-embody ourselves in the world, thereby escaping the prevailing sense that our experience of place is disappearing in late capitalist society' (Tuters and Varnelis, 2006). The *dérive* brings the body to the centre of thinking about digital technology, but the body is always spatial, and along with embodiment the body's situated context must equally be taken seriously. Farman (2009) states that the study of locative media must simultaneously engage the cultural histories of sites, their 'social relationships, associated languages, customs, flora, and fauna': we must also be aware of how such sites can be reorganised and re-signified by the process of movement, especially the movement associated with play (Flanagan, 2008). What emerges from HCI's engagement with psychogeography is an understanding of the relational nature of the digital, physical space and the body in the experience of space.

2.4 Interdisciplinary Research

This review has that many of the strengths of psychogeographic practice as a form of spatial research can be seen to share a common ground with many of the key concerns of both digital cities and elements of Dourish's re-imagined ubicomp. The points of contact include a non-representational perspective, a focus on the affective quality of space and a call to 'read for theory', as well as empirical evidence and a critical attitude to fixed spatial representations. I will provide a brief overview of each of these areas below.

A Non-Representational Perspective

Dourish is critical of research that is evaluated based on its implications for design. He states that, often, ethnography is seen as an approach to field investigation that can generate requirements for systems development; by that token, the major evaluative criterion for an ethnographic study is the implications it can provide for design (Dourish, 2006). He claims

that an implications for design approach can lead to a false claim to objectivity and one that develops a fixed representational perspective. He suggests that, '[…] technologies that seek to enhance, incorporate, or respond to the user experience of space may be limited by the representational schemes by which are used to operationalizing it. If the user experience of space is cultural rather than cartographic, then an alternative foundation for design presents itself' (2011, p.83). Dourish suggests a shift from fixed categorisation to a non-representational perspective that recognises process over fixity. Here he comes very close to the non-representational or more-than-representational perspectives of many cultural geographers and the drift technique of psychogeography is very well placed to research the processual flows and flux of the digitally expanded city.

Nigel Thrift (1997, p.) explains how 'Non-representational theory is concerned with the practices of subjectification (note the crucial 'ion'), not with the subject'. In the works of Foucault and Deleuze and Guattari, subjectification is not concerned with the subject per se, but with the process of how an individual subject is constructed and brought into being. Viewing a subject in relation to its becoming is of key importance, as it attempts to engage with the social coming into being of the digitally expanded city. An example of the way the concerns of subjectification form part of a psychogeographic study of the digitally expanded city can be seen in digital mapping. Digital mapping is approached not simply from the way the space of the city is represented but from the role digital mapping plays in the social process of bringing that space into being.

Non-representational theory draws influence from philosophies of becoming and process philosophy, such as that developed by Simondon, Whitehead and Deleuze and Guattari, and as such, non-representational theory takes serious consideration of what [Nigel Thrift] calls the push that keeps the world rolling over; the energy that fuels change; the work of transformation which ensures that 'the reproduction of the other as the same is not assured' (Phelan 1993, p. 3). Most importantly, this means that the world is a making (Threadgold 1997): it is processual; it is in action; it is 'all that is present and moving' (R. Williams 1972: 128). There is no last word, only infinite becoming and constant reactivation (Thrift, 2008, p.114).

A non-representational perspective is fundamentally a theory of practice and a process theory that is open to the becoming of the world. This makes it highly compatible with the performative aspects of the psychogeographical drift that aims to expose the process of becoming thorough the act of reimagining the city. Researching and understanding the process of subjectification, i.e. how an individual understanding of space is socially produced,

is a central concern for answering the research question *What can a psychogeographical art practice reveal about how spatial subjectivities are produced in the digitally expanded city?*

A Focus on Affect

Affect is a central concern to digital cities research. Exploring the look and feel, the sense of time and flow and the new atmospheres that the digital introduces into city space is one of the core aims of digital cities research. Sadler (1998) has noted that 'Embodied experiences, emotional and affective relations, were central to the SI revolutionary project' in developing the strategy of psychogeography. While the ideological aims of the SI and contemporary affect research my different; Richardson (2015) and Powell (2009) have both noted that psychogeography's 'zones of distinct psychic atmospheres' (Chtcheglov, 1963) can be seen as presaging contemporary discussions around affect. At the same time, ubicomp's interest in affective computing can be seen as sharing common ground with psychogeography's research into affective landscapes.

Ubicomp's Embedded Spatial Representations

Dourish has called for recognition of the importance of ubicomp's embedded spatial representation. He also sees critical theory as being at the core of a reimagined ubicomp and suggest that future ubicomp research should '"read for theory" as much as for empirical evidence' (Dourish, 2011, pp. 74-75).

Psychogeography was originally developed as a strategy to critique fixed spatial representations, such as maps or the modernist redevelopment of the city, with the lived experience of everyday life experienced through walking the streets. Hawkins (2011), elaborates this point;

> Through experimental methods like the collaged map of Naked City, 'detoured' advertisements, and the practicing of de´rive (a mode of experiencing space that reflects that of the everyday user) the Situationists understood and performed space as a 'socially produced category where social relations are reproduced' (McDonough 1994, 66). This contrasted with understandings of space as a fixed and static backdrop that conditioned social relations (Hawkins, 2011).

In other words, the technique of the psychogeographic drift allowed the Situationists to develop a critique of fixed spatial representations of the city by contrasting them with the non-representational affective experience of being in the city. It is within this contrast that a critique of fixed representation emerges.

This research intentionally brings digital representations of the city into productive dialogue with the non-representational affective experience of being in the city, brought together in psychogeographic practices, to answer the research question *What can psychogeography reveal about what happens to digital representations of space when they become part of the lived experience of space?*

2.5 Summary of the Literature Review

Ubiquitous and mobile computing is often presented in terms of the augmentation or mediation of the city by technology. The conceptualisation of the city and its inhabitants as augmented or mediated views the city and its inhabitants as ontologically stable but supplemented by digital technology. In contrast to such a vision, the interdisciplinary literature on digital cities reviewed here understands ubiquitous computing, the space of the city and the practices and psychic life of the people who inhabit them to be in a complex state of mutual becoming. Formulating an understanding of the nature and processes of this mutual becoming is one of the core aims of the research. It recognises that the space of the city has been physically expanded by a technical infrastructure of underground cables, mobile phone networks, wi-fi devices and anonymous office buildings constructed to house cloud servers, an infrastructure that underlies subtle changes in the aesthetic experience and spatial ordering of urban space.

Physical space is been intensely mapped and transformed into digital representations, either overtly through representational models such as Google Maps, or open data streams like those representing city transport networks, or less visibly through data capture, storage and processing. Digital technology can also be seen to play an active role in the production of the space of cities through the logic of their representational practices, including those encoded within GIS systems, such as Google Maps or less explicitly representational models embedded within hardware and software, such as the London Oyster card system that creates representations of its users within computer systems. Algorithms, data collection and sensor devices are being embedded into the city. Digital spatial technologies are expanding the space of the city. The relationship between digital technology and the city is a complex one in which the convergence of digital technology and the city can be shown to have expanded not only the space of the city but also what the space of the city is. The digitally expanded city cannot be understood through the study of a single technology, city or people: it is only by researching the dynamic relationship between these entities that an understanding of the digitally expanded city can emerge. The research carried out in this thesis focuses on how the

digitally expanded city shifts and shapes how its inhabitants experience, perceive and understand the city.

The literature review has outlined how psychogeography developed its conceptual formulation within the post-war avant-garde milieu of the Situationist International, and how the ideas of the Situationists had a direct influence on early media arts practitioners, playing a seminal role in the development of locative media. It has described how the influence of psychogeography and the conceptual framing of artists' locative media projects have brought its practices to the attention of a number of HCI researchers. It has also explored how the cultural turn in geography has created academic interest in the potential of psychogeographic practices to help develop a critical spatial understanding of urban space.

The digital in relation to the city has been defined from four perspectives: ontics, aesthetics, logic and discourse. The ontic qualities of the digitally expanded city (understood as the software, devices and infrastructure that underlie digital processes and practices) are a central concern for the study of digital cities. While psychogeography may not be an appropriate approach for researching the underlying technical qualities of ubiquitous computing, such as code or specific digital devices, it does show potential promise for researching the materiality of digital infrastructure. There seems to be an obvious parallel with Blum's (2012) investigation into the materiality of the internet and psychogeography's practices of uncovering the hidden and overlooked elements of the city. Psychogeography has always taken an aesthetic approach to the city (Wark, 2015, p.538/4537) and its practices presaged current discourse on affect and digital atmospheres. Digital representational practices embody logic that plays a role in the structuring and ordering of urban space. Psychogeography emerged as part of a critical response to fixed spatial representations, contrasting them with the embodied experience of being in the streets. The expansion of psychogeography has the potential to engage in a critique of the new forms of representation embedded within ubiquitous and mobile computing.

The review has found that are important areas of common ground between the theories and practices of psychogeography, digital cities literature and key points of Dourish's call to reimagine ubicomp research. My thesis aims to expand the practices of psychogeography to engage with the wider complexity of the contemporary digitally expanded city that I have outlined above to ask: *What can a psychogeographical art practice reveal about the production of the digitally expanded space in East London?*

3 Methods

In this chapter, I will outline how an original psychogeographic art practice was developed and carried out in practice. I will describe how this practice was used as a source of research into the digitally expanded city. The chapter is divided into two sections: 1) Methodology 2) Research in Practice.

The Methodology section responds to the challenges of using an art practice as the source of spatial/technological research and the particular difficulties of researching the non-representational, aesthetic and affective qualities of 'the digital' described in the literary review.

Research in Practice describes how the research was carried out. It outlines four drifts that extended the original practice of the psychogeographic drift to focus on key aspects of the digitally expanded city. It describes how the drifts were organised and how the methodology was implemented.

3.1 Methodology

Using an art practice as the source of spatial/technological research brings with it methodological challenges, as conflicting ways of knowing are brought together and disciplinary boundaries are crossed. In the creative arts, the outcomes that emerge from an alternative logic of practice are not always easy to articulate, and it can be difficult to discuss the work objectively given the intrinsic emotional and subjective dimensions of the artistic process (Barrett, 2007, p.135). There is a lack of distance between the artist and both the subject and the object of knowledge, and this throws traditional scientific and social science demands for evidence and objectivity into question. The anarchy required by an art practice is the disavowal of any claim to scientific objectivity, and any attempt by the artist/researcher to reflect critically on the artistic merit or artistic value of the products of such research can only lead to accusations of self-valorisation. The key methodological questions that arise from the problematic nature of using my own psychogeographically-inspired art practice as research are: 1) what unique knowledge can a digitally expanded psychogeography hope to produce? 2) What research methodology can adequately engage with, and extract data from, the forms of knowledge produced by a performative psychogeographical practice?

3.1.1 Personal Art Practice

Psychogeography is a highly contested term, and the drift itself has undergone many mutations from its initial incarnation to the multitude of contemporary practices that claim its

name and lineage (Smith, 2010). My own engagement with psychogeography emerged out of the anti-capitalist activist movement in the 1990s and was developed through the collective endeavours of the art activist groups We Are Bad and the Savage Messiah collective. My own practice of the drift owes much to the legacy of these groups and the experiments carried out throughout the mid- to late 2000s. The activism of these groups focused on opposition to the nascent gentrification of London and challenging the increasing privatisation and regulation of public space. Psychogeography was reimagined as a technique for uncovering the quotidian spatial struggles within the city. The drifts were used as the basis of a spatial storytelling, with the aim of making such struggles knowable. The drift narratives were circulated using a mixture of online and offline resources such as blogposts, spoken word, physical installations and photocopied punk fanzines.

My artistic background has its origins in sculpture. An interest in Krauss's notion of 'art in the expanded field' (1979) led to art practices that take place outside of an easily definable art context. Experiments with city-based performance and interventionist practices focused my interest on the practices of historic avant-garde groups such as Dada and the Situationist International. In the absence of the cultural and political climate within which these groups operated, my practice uses the techniques of feral performance. Feral performance involves performing a fictional political group or organisation: for example, creating a fictional 'avant-garde' organisation using myth and storytelling with the aim of bringing into being alternative publics, practices and discourse. Feral performance is the blurring of performance and everyday life using self-organisational and DIY techniques borrowed from activist organising strategies.

To carry out research for this thesis I have developed a new performance practice that takes the writings of the Situationist International on psychogeography as an initial starting point to develop techniques to explore, contest and re-imagine the digitally expanded city. My performance practice is interventionist and aims to work directly within the context of the city. It employs three key strategies: 1) The creation of a fictional political collective, called CODED GEOMETRY,[5] which functions as a performative vehicle to organise events and interventions. This is a DIY performance strategy that creates a context outside of the mainstream structures of the art world through which performance events can be organised. From a methods perspective, CODED GEOMETRY was used to promote and organise participation in my psychogeographic events; 2) The drift, which took the form of an unstructured walk for the Situationists, is reconceptualised as a participatory performative

[5] CODED GEOMETRY was influenced by the writing of Jode Dean (2012) and Mark Fisher (2018), presenting itself as carrying out research for a future communism.

event that encourages digital aspects of urban space to be approached from different perspectives. It encourages the participants to view the everyday as strange and encourages the re-imagination of urban space. The drifts are considered to be performance events in themselves, but they also carry out a secondary symbolic function through the dissemination of invitations, stickers, posters, flyers and documentation. The discoveries made while on a drift are used to inform and develop future interventions. The drifts focus attention on digital aspects of the city, encouraging wider discourse around these themes. In this respect, the drifts can be seen as a form of a radical pedagogy, raising awareness and helping to develop wider public discourse around issues of spatialisation through performance practice. 3) Material gathered from the drifts inform works presented as image, text and sound, which create new mythologies and spatial imaginaries from the fragmented experience of the drifts. The combination of all three strategies forms a feral performance practice that engages in what Simon O'Sullivan (2018) has termed 'mythopoesis' – the act of fictioning a landscape with new images, myths, and narratives. O'Sullivan states that 'images and narrative can be overlaid on a given terrain in order to animate it in different ways' (2018).

I will provide a more detailed overview of the practicalities of my art practice later in this chapter under the subheading 'Research in Practice'. Now I want to consider in more depth the kind of knowledge the research aims to gather from my art practice.

3.1.2 Epistemology

'*Knowledge is not science and cannot be separated from the various thresholds in which it is caught up including even the experience of perception, the values of imagination, the prevailing ideas or commonly held beliefs'* (Deleuze and Guattari, 2005, p. 51)

Experimental research that embraces the performative practices of fine art in general, and my own adapted variant of psychogeography in particular, as a source of knowledge of the digitally expanded city demands that I am explicit about the kinds of knowledge such research can produce. As Deleuze suggests, there is a distinct difference between science and knowledge and the aim of using an art practice is precisely to access the types of 'situated knowledge' (Haraway, 1991) disavowed by disembodied, objectivist, approaches to research.

In her critique of scientific method and what she views as its false claim to objectivity, Haraway suggests that scientific approaches to research are implicated in social constructionist accounts of knowledge that result in the effacement of the particularities of lived experience from which situated knowledge emerges (Barrett, 2007, p.135). Both Haraway and Deleuze question the limitations of what they call 'scientific knowledge', and

their insight can be useful in considering the lived quotidian experience of techno-spatial relations; the emotional, affective, intuitive, libidinal, desiring, dreaming and imagining experience formed within the body of the individual, or their conflictual ideas, beliefs, collective desires and imaginaries; the trans-individual currents that have the power to form assemblages of people within space.

Haraway's feminist call for an alternative position from which to approach scientific knowledge, that of the embodied vision of situated knowledge, has parallels with Deleuze's concept of minor [also referred to variously as nomadic or ambulant] science and its oppositional interrelationship with what he defines as 'royal' science. Bonta & Protevi (2006) suggest that in minor science, one maps the virtual realm, establishing the existence and distribution of the singularities (attractors and bifurcators; patterns and thresholds) of that field by differentiation prior to integration, which establishes actual trajectories and the precise nature of such singularities (Bonta & Protevi, 2006, p. 23). In *A thousand plateaus*, Deleuze and Guattari explain that minor sciences 'subordinate all their operations to the sensible conditions of intuition and construction – following the flow of matter, drawing and linking up smooth space' (Deleuze and Guattari, 2005, p.412). In contrast, what is proper to royal science, to its theoretic or axiomic power, is to isolate all operations from the conditions of intuition, making them true intrinsic concepts, or 'categories' (Deleuze and Guattari, 2005, p. 412). Deleuze and Guattari use a particularly spatial image to differentiate between minor science and royal science: 'It is the difference between a smooth (vectorial, projective, or topological) space and a stratified space: in the first case [minor science] space is occupied without being counted, and in the second case [royal science] space is counted in order to be occupied (Deleuze and Guattari, 2005: 399). This spatial image resonates with Lefebvre's distinction between representational space as the space of inhabitants, and representations of space that are the conceptualised space of planners, scientists and urbanists. (Lefebvre,1991, p.39). Lefebvre suggests that representations of space are imposed on the city. Think, for example, about how some architects' plans are imposed on space versus the embodied representations of space felt by the residents of a particular place. Or the debates within HCI between model-based UX (user experience) and design-based UX. The former utilise intellectual methods derived from usability practitioners when interpreting qualitative human data for measurement. The latter (who Law also terms the 'holistic camp') 'defy the measurability of UX' (Ghassan et al., 2013). In both cases, the comparison is between an abstract universalised model of knowledge which is imposed on space versus the complexities of lived experience which cannot be reduced to universal categories. The argument here is not that minor science is not scientific knowledge. It is that minor knowledge is a different order of knowledge. Minor knowledge is those situated embodied elements of everyday experience

that are lost through objective approaches in research practices. The focus of my research is the digitally expanded city. In the literature review, the digital was defined broadly as ontics, aesthetics, logic and discourse. Researching the digitally expanded city requires a focus on digital aspects of the city: for example, the situated materiality of digital infrastructure, its look and feel, its rhythms and flows, and the discourse it inspires. Many of these aspects can only be approached through felt experience and fall into Deleuze's category of minor science.

Deleuze & Guattari argue that space, for the minor scientist 'can be explored only by legwork' (Deleuze & Guattari, 2005, p. 409). An artisan wishing to craft a wooden object must '[…] go to find the wood where it lies, and to find the wood with the right kind of fibers' (Deleuze & Guattari, 2005, p. 451). This 'pursuing' continues when he is back in his workshop. He cannot plane across the grain of the timber; he must instead work with it. Thus, rather than forcing timber to submit to models of his discipline's creation, the artisan must '…follow the wood, fibers of the wood' (Deleuze & Guattari, 2005, p. 451). The implication is that the researcher seeking the spatial qualities of the digitally expanded city should not start from a predetermined conceptual model, but instead walk the street, noting the situated experience in its situated complexity. The debate between royal science and minor science has become relevant to ubiquitous computing as HCI researchers attempt to gain a better understanding of user experience, described earlier (Ghassan, et al. 2013). Minor science is also reflected in cultural geography through non-representational and more-than-representational theory in which researchers attempt to explore concepts such as affect, mood or atmosphere.

Deleuze and Guattari point to Gothic architecture as an example of the division between the architects and the journeymen who constructed the cathedrals. The royal science of the architect is contrasted with the minor science of the journeymen. The former is rooted in the abstract model, the mathematical, the plan, and the latter is rooted in the practical knowledge of the qualities of materials and everyday practice. Deleuze and Guattari's image of royal science as a striated space, the space of the observer, whose view is premised on distance and detachment, is close to Donna Haraway's description of the 'God's-eye view' (Haraway 1997). Haraway suggests that objectivity can only ever be partial, and embodied vision involves seeing something from somewhere. It links experience, practice and theory to produce situated knowledge, knowledge that operates in relation to established knowledge, and thus has the capacity to extend or alter what is known (Barrett, 2007, p.145). The important thing to note is that situated knowledge is not an alternative to established knowledge; it operates in relation to it. Similarly, Deleuze and Guattari warn about the instability of minor science: 'two cathedrals at Orleans and Beauvais collapsed' (Deleuze and

Guattari, 2005, p. 412), and conclude that 'the ambulant sciences confine themselves to inventing problems whose solution is tied to a whole set of collective, nonscientific activities but whose scientific solutions depends, on the contrary, on royal science and the way it has transformed the problem by introducing it into its theorematic apparatus and its organization of work' (Deleuze and Guattari, 2005, p. 374). The inclusion of non-representational perspectives and embodied knowledge such as affect by both cultural geography and HCI reflects the way Deleuze's minor science is now a mainstream aspect of their disciplinary research toolkits.

A close reading of the ideas of Deleuze and Guattari, Haraway and Lefebvre will point to important and irreconcilable differences in their approaches; what is important for my research is a recognition that all three of their theoretical positions describe a productive dichotomy between the formal knowledge of the distanced observer and the embodied knowledge of the observant participant. It is not the intention of this research to turn psychogeography into a rigorous research practice that can produce quantitative data that can be validated. Rather, the techniques of psychogeography will be adapted and researched in order to discover the forms of subjective and intersubjective knowledge that emerge from the artistic employment of its techniques; the situated and embodied, the affective, the speculative reimagining, the dreaming and desiring, the invoking of individual and cultural memory, the making visible of trans-individual currents that create stability and those that threaten it, and the problems it invents and the challenges it throws up.

My research will focus on the techniques of psychogeography in order to assess its potential for producing new knowledge about the relationship between ubiquitous computing and the space of East London. It is particularly hoped that by capturing and presenting the situated knowledge produced through a psychogeographic practice a complex techno-social geography of East London will emerge.

3.1.3 Performative, non-representational, and affect-based research

A psychogeographically-inspired art practice requires a research methodology that understands performance-based interventions. It requires a methodology that can produce data from the performative events of the drifts without disrupting, influencing or leading the experience. The non-representational and affective aspects of researching the digitally expanded city requires an observant participation in events which gather experiense that can only be registered and recorded through the sensual, emotional vehicle of the body engaged in practice: a body sensitive to a space's affective quality whilst also remaining open to the personal emotional and transindividual forces and imagination arising from the digitally

expanded city. It requires a method that can present its findings in a form that retains the performative qualities of the event, so that contrasts can be made with fixed representations of space.

Dewsbury (2010) developed a research method for gathering embodied information from spatial environments through performance, and my research employs and adapts his 'performative, non-representational, and affect-based research' methodology. Dewsbury's methodology can be delimited into two distinct aspects, sensing and presentation. Sensing seeks to find a method of recording the knowledge co-produced by a drift. Presentation asks how such experience can be presented beyond the immediacy of the drift whilst maintaining the performative qualities of the event. This chapter will examine in more detail the theoretical and philosophical approach developed by non-representational and affect-based research, asking how suitable Dewsbury's methodology is for the study of a performative and digitally expanded psychogeography, and to what extent this method needs to be adapted to the specificity of researching psychogeography in the digitally expanded city.

3.1.3.1 Sensing - 'Gathering Data from Psychogeographic Practice'

Performative, non-representational, and affect-based research first and foremost takes the body seriously and places it at the centre of the action as participant, performer, collaborator and instigator of events. The idea is to become embroiled in the site and allow ourselves to be infected by the effort, investment, and craze of the particular practice or experience being investigated (Dewsbury, 2010, p. 326). The call here is to engage with the empirical site with the aim of making use of the entire sensory system of the body, the sensorium, as a receptor of the experience. Elizabeth Grosz argues that 'If bodies are objects or things, they are like no others, for they are the centres of perspective, insight, reflection, desire, agency. They require quite different intellectual models than those that have been used thus far to represent and understand them' (Grosz, 1994, xi). The research strategy employed by my study is to directly engage with the performative event of the psychogeographic drift. Through direct engagement with the digitally expanded city the body is opened up to what Thrift refers to as

> A kind of energetics, an interest in moments of indeterminacy, undecidability and ambivalence, the abandonment of subject-predicate forms of thought, an orientation to thought as inclusive of affect, and, in general, a sense of the 'tone' of any situation, the play of singularity, which might (and only might) produce new virtualisations. (Thrift, 2004. p.85)

The drifts are also collaborative events, and the social dynamics play a fundamental role in

the experience. Social interactions, conversations are recorded alongside personal felt experience.

The aim of such immersion within the practice of psychogeography is not to abandon the aims of academic research in favour of unreflective or uncritical experience. It is an alternative method to observing from afar, from 'sitting on the sidelines': its aim is rather to become immersed within a space in order to gather what Dewsbury (2010) describes as a portfolio of ethnographic 'exposures' that can act as lightning rods for thought. It places the body 'directly in the field as a recording machine [. . .] knowing that writing these nervous energies, amplitudes and thresholds down is feasible, as such jottings become legitimate data for dissemination and analysis' (Dewsbury, 2010, p. 327). In this respect my research expands psychogeography by developing practices which expose the body to a total media ecology, the massive and dynamic interrelation of processes and objects, beings and things, patterns and matter, (Fuller, 2005, pp. 2-3) that form the digitally expanded city and then to record these exposures by becoming sensitive to, and making notes on, the experience.

Bridgers, 2013, has made extensive use of psychogeography in the field of psychology, and his description of his method correlates with that advocated by Dewsbury.

> My preference is for an unstructured method of data collection ... Although it is important to bear in mind the questions and aims underpinning the research whilst out on a derive [drift], the way in which data are collected should remain quite unstructured, since the participant/s would be using broadly free associative techniques to explore environments and their experiences of these. A simple notepad or a digital recorder can be used to document any thoughts and ideas which may be relevant to the questions and aims of the research, and to write down any other thoughts and feelings that arise in the process of such work (Bridgers, 2013).

My research approaches data collection using a similar unstructured method, making notes on both the personal and collective experiences, observations and thoughts that arise. Bridgers also makes use of photography as a form of data gathering and note-taking in his practice of psychogeography.

> A camera or camera phone would be helpful in remembering the places that were encountered as well as to document any features relating to the research aims. Photographs can also be used to remember one's experiences of being in particular places and to consider how individuals create meanings within the places in which

> they are located (Bridgers, 2013).

My method complements note-taking with the use of photographs, screenshots and field recordings, both as a way of recording and provoking my own experience and because such material contains another way of knowing in itself which can become the basis of secondary artistic responses. Bridgers' invocation here to consider how individuals create meanings within the places in which they are located is perhaps a point of contestation between his approach to research and non-representational theory. However, it is in the contrast that occurs between non-representation and embodied representational forms of knowledge that I think something interesting occurs. These notes and images collected through engaged practice are gathered together to form a research diary.

Frayling (1993) has described the use of a research diary by artists to document their research whilst carrying out practical experiments, developing new artistic processes or using new materials. The research diary allows empirical data, which will no longer be visible in the final outcome of the production process, to be preserved and available for later reflective analysis.

The relationship of the body, viewed as a sensorium, to the space of the digitally expanded city is what is at stake in this research. In the 'Introduction' to *The senses in performance* Lepecki and Banes (2006) define the complex relationship between the sensorium of the body and the media ecology of the digitally expanded city.

> Now, to cast the body as essentially metamorphic within the force fields of history is to give to perception and the sensorium central roles that transcend the purely somatic. Neither can be seen any longer as anthropologically stable, historically neutral, or a culturally passive neuro-physiological basis where subjectivities find common ground. On the contrary, perception and the sensorium are to be understood as historically bound cultural agents, constantly being activated and repressed, reinvented and reproduced, rehearsed and improvised. In an intertwining process where the somatic, the physiological, and the neurological criss-cross the historical, the sociological, the political and the imaginary, the profoundly performative interfaces occurring between history, corporeality, power, language, and the sensorial become apparent (Lepecki and Banes, 2006; 1).

From this set of observations Lepecki and Banes argue that performance is an appropriate means for approaching the sort of bio-political investigations implicit in developing a

psychogeography of the digitally expanded city.

> No wonder then that performance practices become privileged means to investigate processes where history and body create unsuspected sensorial-perceptual realms, alternative modes of life to be lived. To carry out bio-political investigations of the many critical thresholds where the corporeal meets the social, the somatic meets the historical, the cultural meets the biological, and the imagination meets the flesh (Lepecki and Banes, 2006, p. 2).

Dewsbury states that 'It is then in those key times out, as we set upon generating inventive ways of addressing and intervening in that which is happening, and has happened, as an academic, that such a method produces its data: a series of testimonies to practice' (2010). The key to this research method is therefore to be totally immersed in the performative event, but this should be an immersion that is observant and sensitive, producing a research diary of notes, images, and other media that attempt to preserve the social, non-representational and affective experience of the drifts.

The organisation of psychogeographic drifts, the performative events, that form the empirical site for emersion and data collection required a framework that could function beyond the confines of the research process: a vehicle by which people could be gathered together and walks, drifts and events organised. With this in mind I employed the organisational tool and performance strategy of self-institutionalisation.

Self-institutionalisation is a practice developed from DIY cultures engaged in self-publishing and self-organising to construct autonomous social networks and means of production and distribution of alternative culture, and has always been a fundamental aspect of psychogeographic practice since the founding, by the British artist Ralph Rumney, of the London Psychogeographical Association. Self-institutionalisation is a form of performance gone feral, slipping the context within which it is easily identified as performance.

The technique of self-institutionalisation was used to develop a performative online presence under the name 'CODED GEOMETRY', in order to create a context through which digitally expanded psychogeographical events could be organised. CODED GEOMETRY was constituted through the development of an online presence, the building up of an email list, the organisation of drifts and events exploring the digitally expanded city, and the documentation and presentation of psychogeographically-inspired experiments.

3.1.3.1.1 Positionality

The act of consciously using my art practice in this way requires me to take a position regarding the relationship of the researcher to the production of research data. It places me in what Caitlin Cahill et al. (2007) calls the 'tricky ground' grappling with the politics of collaboration, positionality, accountability, and responsibility. The role of observant participant implicates me within the research data and it blurs the boundary between ethnography and autoethnography. I draw on both personal felt experience, memory and biography and from the perspective of the observer within events. Such a position is necessary in order to access and report upon the affective experience of the performance and to gain exposure to the processes through which changes within spatial understanding occur. Such positionality raises ethical questions regarding my relation to the 'other' within the study. Using my body to collect affective experience, whether individually or collectively felt, also raises questions about bodies in research. Experience will vary dependent on the specificity of the body carrying out research raising questions about identity, for example, gender, race, class and ability. I respond to these ethical questions by drawing on Haraway's concept of situated knowledge to argue that 'only partial perspective promises objective vision' (1988, 583). Haraway points to the objectivity of the partial perspective which 'allows us to become answerable for what we learn how to see' (1988, 583). The partiality of the knowing self makes possible unexpected connections and openings that, as Haraway argues,

> The knowing self is partial in all its guises, never finished, whole, simply there and original; it is always constructed and stitched together imperfectly, and therefore able to join with another, to see together without claiming to be another (1988, 586).

The aim of the observant participant within a collaborative and coproduced performed drift is precisely to see and feel together without claiming to be the other. The drifts are not performance events that attempt to maintain the distinction between performer and audience. The performative aspect of the drift is its strategy to refocus the participants' attention on the digital aspects of the city, but the drift itself is driven by the participation and collaboration of the participants. My position is one of organiser and co-producer alongside other participants. I illustrate my findings from the first person but my research interest is the socially constructed process through which

space is produced through the drift.

I acknowledge my position within the research. I am a white middle-aged male, from a working-class background, with a privileged art education. However, my aim is not to present the perspective of identity, rather I aim for the objective position of situated and partial knowledge. As Haraway (1988, 586) states,

> Here is the promise of objectivity: a scientific knower seeks the subject position, not of identity, but of objectivity, that is, partial connection. There is no way to "be" simultaneously in all, or wholly in any, of the privileged (i.e., subjugated) positions structured by gender, race, nation, and class.

My research does not make universalist claims, it rather seeks to highlight observed situated processes.

3.1.3.2 Presenting - "Research as performance"

> *I am an artist, and therefore a liar. Distrust everything I say. I am telling the truth'.*
> Ursula LeGuin

How can the playful, ambiguous, speculative, non-representational and affective experience of the drifts be represented within the thesis?

A performative approach to research requires some form of presentation beyond the event. This inevitably creates the problem of 'How to present performance when it is not a performance any longer, and then, as so often, in another medium altogether' (Dewsbury, 2010). Hawkins (2011) has noted that many geographers using performance techniques to explore urban space have developed critical creative writing styles to evoke (rather than simply to describe) the experiences of being in – and moving through – landscape (e.g. Cant and Morris, 2006; Crouch, 2010; De Silvey, 2005, 2006; Lorimer, 2006; Lovejoy and Hawkins, 2009; Merriman and Webster, 2009; Wylie, 2005). Such creative writing styles recognise that the researcher cannot directly capture the lived experience of the drift but instead aim to 'embrace forms of writing or other presentational activities that collapse the distinction between representing and performing experience' (Butz, 2010). The aim is to present the fragmented, imagined, non-representational and affective experience of the event through forms of performance writing, photographs and other creative means.

Dewsbury (2010) suggests that whilst it has long been accepted that the author is not a neutral vector for the conveying of information, the performative method utilises this act visibly,

exposing it to opening up the possibility of experimenting with the manner and mode of the statements through which the research can be made 'known'. A performative presentation of the research allows unformed bodies of knowledge, as yet undefinable images and observed moments that have not yet found their conceptual place within representation to be presented within the research. These are the fragmented and incoherent, the as yet unstable elements that are precisely the processual forms of knowledge this research seeks to expose and understand through the use of psychogeographic practices. This research walks and becomes saturated by the milieu from which the seeds of a digitally expanded city are crystallising; presenting this experience demands a performative approach that employs a number of strategies which retain the fractured juxtapositions, disorientation and estrangement from the everyday that are a key feature of the practice of psychogeography. It also acknowledges upfront that such texts are a form of fictioning (O'Sullivan, 2018) the landscape, an act of engaging with the production of the landscape, not just its representation.

The experience of the city which occurs when experienced through the practice of psychogeographic drifting is non-linear. It is broken and fragmented as one site of interest holds the attention only to be superseded by another. One ambience is disrupted by another as corners are turned and streets are followed. Whilst rooted in the moment, psychogeography is not restricted to the temporal moment, it time-travels within the present, it reawakens ghosts from the past and folds potential futures into itself. Any attempt to present the data gathered through the psychogeographic process must equally be formed through broken, non-linear images constructed from multiple vantage points and temporal transgressions. This thesis presents Practice inserts between substantive empirical chapters that include performance writing and other visual material – for example, photographs, screenshots and a link to sound recording – to disrupt the analytical text with other presentational activities that collapse the distinction between representing and performing experience.

3.1.3.3 Developments in Research Methodology

Dewsbury's methodology focuses on a non-representational understanding of spatial experience. This is essential for the embodied and sensory aspects of psychogeography. However, there are a number of key areas in which carrying out digital cities research using a psychogeographic art practice goes beyond a non-representational approach. These include the embodied representations and spatial narratives of walkers, the individual and collective spatial imaginaries of the drift participants and the focus on the digital representational practices of ubiquitous and mobile computing. While maintaining Dewsbury's key methodological research approach, I also drew from discourse set out in Pink's (2009) *Doing sensory ethnography*, and specifically her discussion of sensory memory (p.38) and sensory

imagination (p.39) in which she argues that both memory and imagination are an active part of our individual way of being in the world. Memory and imagination are not simple representational practices but are active fuel for action. She mirrors discussions within psychogeography around hauntology (Fisher, 2013) by suggesting that memories are not mere repetition but a transformation that brings the past into the present as a natal event (Pink, 38). Similarly, she argues that imagination, especially when it arises in a social group, can become a motor for action. The configuration of the role of imagination in contemporary social processes provides a compelling argument for our attending to the imagination in academic and applied research (Pink, 39). I will elaborate on the important role of memory in Chapter 4 and spatial imagination in Chapter 5. Representation is confronted directly in Chapter 6 as I set up a contrast between the representational practices of Google Maps and the embodied and sensory experience of the drift.

3.2 Research in Practice

There is a clear separation between the performative aspect of the psychogeographic drifts and the research aims of this thesis. The drifts are performance events through which research is carried out. The drifts themselves take the form of performative explorations of a digitally expanded East London that encourage participants to perform, critique, and re-imagine the city from different perspectives. It is through creating scenarios that encourage participants to reimagine the city that the research gains access to the process through which space is socially brought into being, developing a better understanding of the role digital technology plays within this process.

This section of the thesis will describe how digitally expanded drifts were carried out in practice and provide an overview of each of the four drifts that form the empirical work carried out within this research.

3.2.1 Psychogeography in practice

Psychogeography is itself a contested term. Therefore, for the purpose of this thesis, the practice of psychogeography is considered to consist of two combined but distinct aspects: 1) The performative event of the drift. This is an unstructured walk carried out by two or more participants; 2) The presentation, or mapping, of a territory that emerges from the experience of the drift using images, performance writing and/or sound. Phil Smith (2016) describes these two practices in the following way.

> 1) Walking – wandering. Not buying, window shopping or taking part in leisure activities – but just letting the flows and currents and rhythms of the city pull and

> draw them. The situationists called this ‘dérive’ or ‘drift’: they hyper-sensitized themselves to the city’s shapes, symbols and encounters; letting its atmospheres be their guides.
>
> 2) ‘Psychogeography’ is what you get from this ‘drifting’ – it’s a kind of mapping or surveying, in words or visual representations, of two things – the psychic, psychological, poetic, empathic and telepathic effects that the streets have on you; and the manifestations of psyche, association, personality, spirit of place that are physically manifest in the street’s architecture. (Smith, 2016)

One of the fundamental strategies invoked by psychogeography is to carry out a performative estrangement from the mundane everyday, to uproot the walker from their predicted paths and jolt them into a new awareness (Hart, 2004), in order to render the everyday more accessible. The drifts carried out as part of this thesis were walks within East London involving two or more participants. The drifts were designed to disrupt the everyday experience of the participants, enabling them to break out of everyday routines and re-imagine the city from different perspectives: for example, from the perspective of the invisible geography of electromagnetic communication. This was an active act of estrangement aimed at making the familiar unfamiliar with the express aim of researching how this new landscape was collectively constructed.

As described in the Methodology chapter, data was gathered from the perspective of being directly engaged within the drifts. It was essential that data gathering did not disrupt or interrupt the free flow of ideas and conversations that emerged as participants explored the environment. The data collection took the form of unstructured note-taking, photographs, field recordings and, in the case of the digital drift, screenshots. I attempted to note all significant experiences, from personal feelings to topics of conversation or any other strong response to the environment either from myself or those around me. Images and sound recordings were an essential part of my note-taking, allowing me to participate in the events.

After collecting these notes and images they were added to a research diary, which was then used as the basis of my critical analysis and the source material to write up the experience as performance writing and form. The research diary can be seen as an intermediary step between the experience of the drift in and of itself and its re-representation through analysis and performance writing.

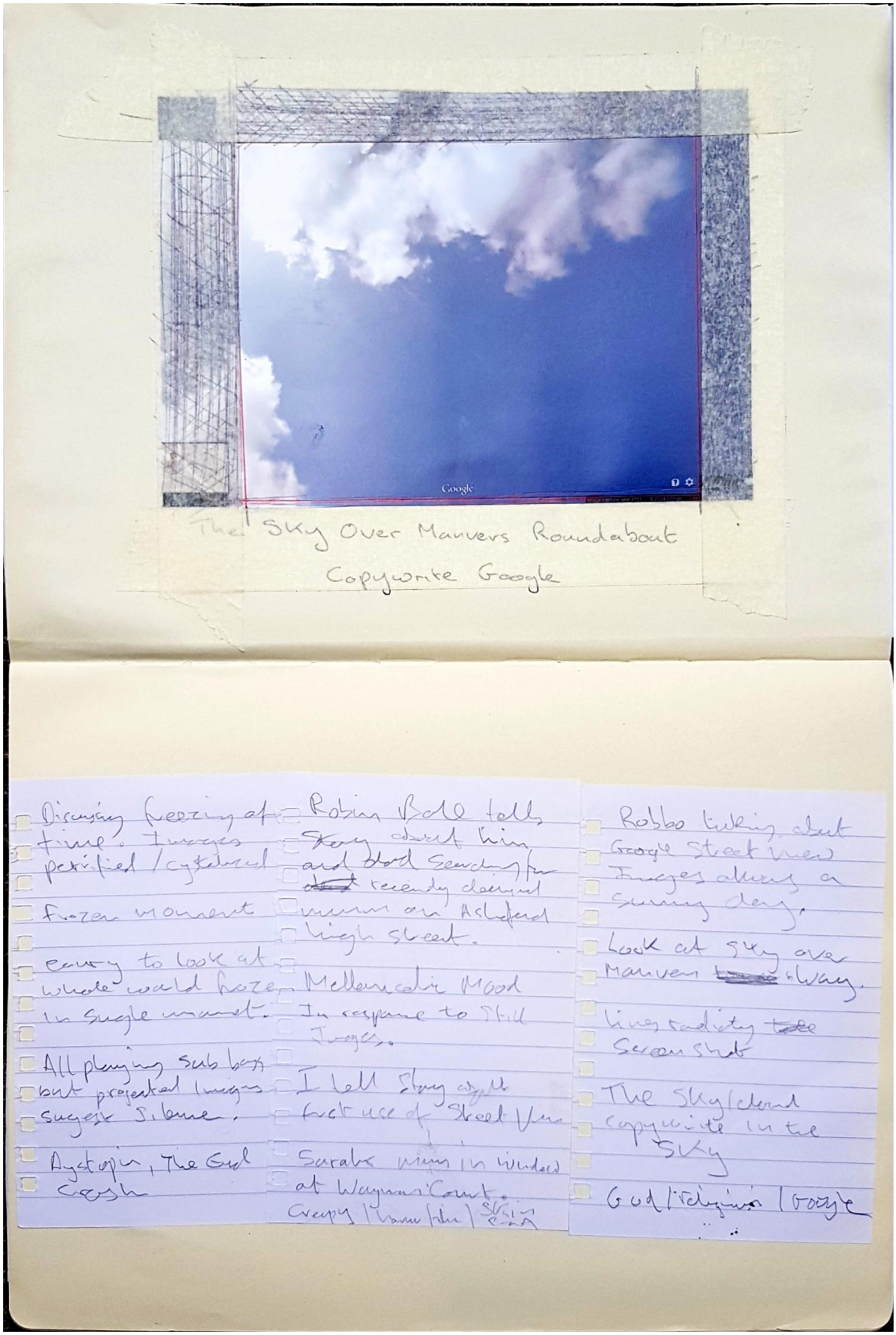

Figure 1- Research Diary

The drifts were restricted to East London, stretching between Old Street in the west, Finsbury Park in the north, the A2 in the east and Docklands in the south. This area of East London has

received government investment to encourage its development into a technology hub, and has historic ties to the practices of psychogeography. It contains many technological developments to explore. There are major data centres sited at Docklands, and a high density of technology companies located within this area ensures the possibility of discovering, through walking, unexpected technological interventions. This area also has a parallel connection with the practice of psychogeography. The former Sailors' Mission, located in Limehouse, was the secret location of the 4th conference of the Situationist International (SI), held between 24 and 28 September 1960; 'The Psychogeographical Games' were organised as a playful part of the conference. Guy Debord, who is credited with defining the practice (Debord, 1956, p.5), was in attendance. East London was also the home to the headquarters of the reconvened 90s version of the London Psychogeographical Association. This intersection between East London's psychogeographical history and its current position as a technology hub makes it ideal as the focus for a psychogeographical exploration of the digitally expanded city.

This research has been carried out through four drifts, each developed to explore a different aspect of the digital expansion of East London. Each drift can be considered as a different cut into a single territory, exploring it from different perspectives and producing a complex fragmented mapping of a single area.

3.2.2 Overview of the Drifts

Four drifts were organised. Research design is perhaps a misleading title, as it implies that the four drifts were designed in advance, the research was carried out and the results analysed. This would have involved imposing a predefined model onto the research. Following the indicative suggestion of Deleuze's minor science, the drift developed iteratively as the findings, experience and analysis of one fed into the next.

The first drift, 'In the Cleansed Spaces the Wild Flowers did Grow', followed, as closely as possible, the walking technique of the drift originally devised by the Situationist International and focused on the general ambience and social and political background of East London. It took seriously the argument that space and spatiality is always already 'marked by circuits of digitality' that are themselves irreducible to digital systems (Ash et al., 2018). This drift helped me develop an understanding of how spatial subjectivities are produced in practice and answer the research question *What can a psychogeographical art practice reveal about how the digitally expanded city is producing new spatial subjectivities?* However, it also highlighted the difficulty of isolating 'the digital' within the city. Conversations at the end of the drift suggested that ubiquitous and mobile computing has become so integrated into the

background experience of the city that they are rendered at the limits of perception. This first drift highlighted the need to expand and adapt the technique of the drift to focus on the unique spatial qualities of ubiquitous and mobile technology.

CODED GEOMETRY was approached by Lucy Woodhouse, who was curating an exhibition with the title 'The Edge of Human'. Lucy was interested in the concept of digital psychogeography and invited CODED GEOMETRY to participate. This invitation gave me the opportunity to experiment with a different approach to the drift. I suggested an experimental digital drift named 'The Manvers Main Complex'. Abandoning the usual conventions of walking the streets, the drift used a 3.5-metre wide projected image of Google Street View and a wireless mouse to navigate through a landscape of projected streets. This drift was the antithesis of the Situationist psychogeographical aim to disrupt the spectacle; however, I saw it as an opportunity to directly confront Google Maps' digital representational practices. The Hackney drift had found that mobile use had become so ubiquitous that it had retreated from consciousness and become part of the general habit of navigating the city. Drifts aim to break people out of their everyday habits to view the city from a new perspective. The hope of the Manvers Main digital drift was to focus the participants' attention on Google's digital representational practices and help to answer my research question *What can psychogeography reveal about what happens to digital representations of space when they become part of the lived experience of space?*

The third drift, 'Invisible Geographies', built on the observation that digital technology represents an invisible presence in the city. It made use of radio frequency (RF) receivers to convert the machine-to-machine communication of digital technologies into sound. The aim was to stage a drift through the more-than-human geographies of digital communications networks. The Invisible Geographies drift aimed to reveal the usually inaccessible unique qualities of ubiquitous and mobile technologies and start to answer the research question *What can a psychogeographical art practice reveal about the role infrastructure plays in the production of the digital expanded space of East London?*

The fourth drift, 'Searching for the Cloud', continued the investigation into the unique ontic qualities of digital infrastructure through a drift that sought the physical sites that enable cloud computing. This drift linked seven of the key sites in the London Internet Exchange (LINX) that enables London's internet by connecting it globally.

Leszczynski (2015) defined the digital city as the never complete coming-together of persons, technical presences (spatial media), and space/place (Leszczynski, 2015). The four drifts

represent three cuts into the digitally expanded city that broadly coincide with Leszczynski's categories: 1) The virtual psychic life of people; 2) The actual materiality of space/place, including its digital infrastructure, and 3) The potential technical presences that emerge from digital representational practices.

The four drifts form the empirical basis of the research, which aims to produce new knowledge. However, the context within which this research has been carried out is an engagement with a psychogeographically-inspired performance practice, and the artistic, performance and aesthetic choices have been taken seriously in the organisation of the events. Each drift was designed to focus on different aspects of the way digital technology is transforming East London and conceptually developed to encourage the participants to think differently about the area under exploration. I will now look at each drift individually.

3.2.2.1 Drift 1 - In the Cleansed Spaces the Wild Flowers did Grow

The first drift, referred to as 'the Hackney Drift' from this point, was carried out at 2pm on 15th October 2014. The drift consisted of six participants and started outside Hackney Town Hall. The participants were self-selecting, which resulted in two female walkers and four male, all white and between the ages of thirty and fifty. This drift was organised using an email list developed through organising previous performances, interventions and psychogeographic drifts. Email lists are an essential tool for my organisation of performance events. The mailing list I have developed includes people interested in psychogeography, radical history walking and anti-gentrification politics. It should be acknowledged here that this method of organising attracts a distinct demographic. The core participants were drawn from the same milieu as many previous events. This resulted in a distinctly political and specialist group. Most people had participated in drifts before and had a conceptual understanding of psychogeography. The majority had a personal understanding of Hackney Central and its radical history and all identified in some way with the anti-gentrification movement. This first drift aimed to function as a grounding exercise, clarifying some of the methodological decisions, defining the particular form of psychogeographic practice, exploring what such practices can reveal about the digitally expanded city and exposing necessary future adaptations and experiments. This drift was not digitally augmented in any way and took as its starting point the notion that the city is already inscribed with circuits of digitality. It sought to locate the digital within the everyday, seeking out points of intersection between digital technology and the city.

The participants gathered on the steps of Hackney Town Hall between 2 and 2:25 pm. The initial meeting was dominated by storytelling and nostalgia. Most of the participants already

knew each other and had strong ties to this location. No real plan had been decided for the walk but a number of key sites emerged from the conversations as we waited for everyone to arrive. When we first started walking we headed down Reading Lane towards Ellingfort Road, where one of the participants had lived in a squat in the early 2000s. From this point on the direction of the walk was led by an interest in certain key sites that emerged from the group. I provided very little guidance to this drift. More guidance would have been necessary if this group were not already experienced.

The Hackney Drift exposed a number of issues that were addressed in later drifts – for example, the important role memory, nostalgia and storytelling played in how this specific group made sense of this location – but more pressing for my research was the difficulty of isolating 'the digital' within the city. Conversations at the end of the drift suggested that ubiquitous and mobile computing has become so integrated into the background experience of the city that they were rendered at the limit of perception.

3.2.2.2 Drift 2 – Manvers Main Complex

Figure 2 - 3.5-metre wide projected image of Google Street View

'The Manvers Main Complex', referred to as the Manvers digital drift from this point, was staged as part of the Edge of Human project, an exhibition and programme of performance events, curated by Lucy Woodhouse and organised by the French Riviera Gallery. The event

was staged between 4 and 5:30pm on Sunday 16th November 2014, at 70 Paul Street, Hackney, London.

The Manvers Main Complex explored Google Maps as a site for a digital drift. Abandoning the usual conventions of walking the streets, the drift used a 3.5-metre wide projected image of Google Street View to navigate through a landscape of projected streets using a wireless mouse. The drift was situated within East London but, recognising the inherent tendency for Google Maps to enable a transgression of place, the drift was not restricted to Google's representation of East London and focused on the Manvers area of South Yorkshire.

Figure 3 - Manvers Digital Drift

The drift had a dedicated core participation of nine people. However, throughout the event a further twenty-one people participated. The organisation of the drift was carried out jointly by me and the curator. The Edge of Human project had its own dedicated website and distributed posters and a programme of performance events that advertised the drift. I also publicised it using my mailing list and two Facebook groups dedicated to psychogeography. A6 printed flyers were also produced to promote this drift and to establish CODED GEOMETRY. Participation in the drift varied. A core group who had come specifically for the drift remained throughout and contributed through conversation and directing the drift using the mouse. Unlike a conventional walk, the gallery setting and screen-based nature of the digital drift led to a larger group of passive participants who took part by watching.

The emergence of passive and active participation altered the dynamics of drifting. I felt that only the most confident collaborated. I asserted a more organisational position within this event, leading discussions based on my biographical knowledge of the Manvers area. However, a number of key participants also contributed their stories to the event.

The experience of organising and participating in this experimental form of drift provided the source research data to develop a framework for understanding and working with digital representations of space by situating them in practice. The findings of this drift are outlined in depth in Chapter 6, Potential Space.

3.2.2.3 Drift 3 - Invisible Geographies

Invisible Geographies expanded the practice of the psychogeographic drift by making transmissions of communications infrastructures knowable to drift participants through sound. Drift participants were provided with home-made broad-spectrum radio frequency (RF) receivers. The radio transmissions from digital equipment such as mobile phones, wi-fi and Bluetooth were made audible throughout the walk by connecting the RF receivers to portable audio amplifiers. It was an active choice to use portable amplifiers with attached speakers rather than headphones, which would have isolated the walkers from each other. This enabled findings to be shared and discussions to take place freely amongst the participants.

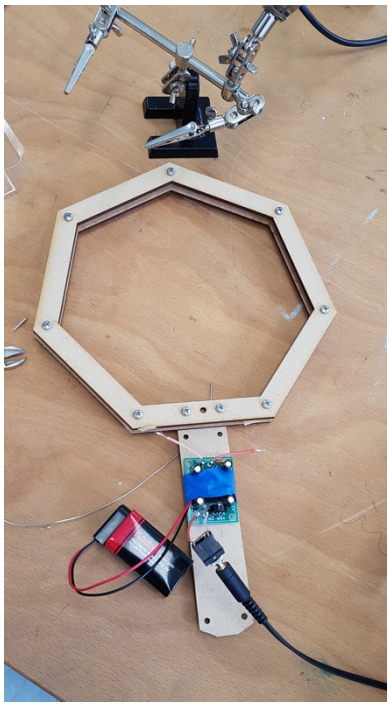

Figure 4 - RF antennae

Two types of RF receiver were used. The first devices were commercial A-com broad spectrum RF detectors, tuned to receive transmissions within the 50MHz-6000MHz spectrum, licensed in the UK for mobile phones, wi-fi and Bluetooth.

The second type were RF antennae I constructed myself, based on an the open-source heptagonal magnetic antenna developed by LOM instruments.[6] These were constructed from 3mm laser ply. The plywood heptagonal antennas were wrapped with 0.118mm wide copper wire. The antennae are tuned through the number of turns of copper wire: 333 receives a broad range of signals. My design built on the original by adding a pre-amp to the antenna,

[6] Full details of the LOM instruments design are available online: https://github.com/LOM-instruments/Priezor/blob/master/README.md [Accessed 26 Aug. 2019]

boosting the signal before it connects to the amplifier. Each antenna was connected to an amplifier and speaker.

The RF antennae are also sensitive to a wide array of electromagnetic fields produced by devices such as laptops, but also by mains electricity and overhead pylons, exposing not only digital radio frequencies but also the supporting electrical infrastructure. Use of the antennae within the drift make wireless infrastructures audible, allowing the participants to become aware of their presence as they walk the environment. To gather data for this thesis, I organised two performances of the Invisible Geographies drift, the first in Limehouse and the second at Finsbury Park.

Figure 5 - Participants taking part in the Invisible Geographies Drift

The first East London Invisible Geographies drift was carried out on Saturday 15 April 2015. Five people participated in the drift. It started outside Limehouse Sailors' Mission and walked to the Robin Hood Gardens estate, where field recordings were made of the estate's electromagnetic communications. The Robin Hood Gardens drift was organised under the auspices of CODED GEOMETRY, using my performance mailing list. The start and end point of the drift were chosen for symbolic reasons. The Sailors' Mission was the secret location of the 4th conference of the Situationist International (SI) and Robin Hood Gardens was a politically contested site, as it was being cleared for demolition. The drift attracted participants with an interest in, and knowledge of, psychogeography.

The second drift took place on 12 April 2019 as a performance presentation at 'Approaching Estate: Methodologies for Practices of Site and Place', held at the Furtherfield Commons gallery space in Finsbury Park. The event was organised by the Sensingsite research group based at Central St. Martins. The participants in this drift were predominantly artists, researchers and academics with a specific interest in site-based fine art and performance

practices. This presented me with the opportunity to test the Invisible Geographies drift with a wider range of participants.

Disparities between the two drifts are interesting from a research best practice perspective. The Robinhood gardens drift was given an initial route and aim. This maintained the singular dynamic of a drift. The Finsbury park drift was not given any aim other than to explore the invisible geographies of the park. The Finsbury park drift brock into small groups and took the RF receivers in different directions breaking the group dynamic of a drift and making it difficult for me as a researcher. I responded by moved between different groups, therefore only recording partial aspects of the event.

The Invisible Geographies drift expanded the practice of the psychogeography to allow the walkers to investigate the unique tone and texture of the more-than-human geography of data transmissions produced by ubiquitous and mobile computing. This drift was designed to reveal the ontic nature and unique aesthetics of wireless data communications.

3.2.2.4 Drift 4 - Searching for the cloud

Figure 6 - Global Switch Data Centre Nutmeg Ln, Poplar, London E14 2AX

Searching for the Cloud began at 10am on Monday 25 January 2016. The Searching for the Cloud drift was organised using my performance mailing list and posts on the CODED GEOMETRY website. This was the least successful drift involving participants. There were two, me and Laura Grace Ford . I suspect the reason for this was the 10am Monday start and bad weather on that morning, combined with the neglect of the CODED GEOMETRY project over the preceding months. Despite these setbacks we decided to continue and carry out the drift.

The drift began at Chrisp Street market. I had carried out prior internet research into the infrastructure of London's internet infrastructure and had identified the London Internet Exchange (LINX)[7] as significant. According the LINX website this is one of the largest internet exchanges in the world, connecting over 880 member-autonomous networks from over eighty countries around the globe. LINX consists of two separate high-performance Ethernet switching platforms accessible from sixteen data centre locations.[8] The sixteen LINX sites represent important nodes in London's digital infrastructure. These sites are the meeting point where data flows from one physical network to another. LINX boasts direct access to Atlantic Crossing 1, and the West African Cable System, the physical cables that connect London to the USA and Africa. Out of the sixteen data centres that make up the London Internet Exchange, nine of them fall within East London and seven are within walking distance of Chrisp Street Market. More in-depth internet research produced a map of London's dark fibre network produced by Interoute Communications Ltd. Interoute Communications Ltd was a privately operating telecommunications company, hosting Europe's largest cloud services, and has since been acquired by GTT Communications. The map showed London's optical fibre route used as the backbone for internet communication. The network links together all of the LINX data centres. The Searching for the Cloud drift followed the map of the underground optical fibre network to walk a route that linked the six sites local to Chrisp Street market. Serendipitous encounters and openness to chance are an important part of the drifting. A lucky accident that occurred on the walk was a chance meeting with a telecoms engineer who worked in the Equinix data centre. He agreed to meet us on his lunch hour to talk about London's internet infrastructure.

Searching for the Cloud, combined with the Invisible Geographies drift, was used to gather data to answer the research question *What can a psychogeographical art practice reveal*

[7] The London Internet Exchange (LINX) is one of the largest internet exchanges in the world, connecting over 880 member ASNs from over 80 countries around the globe.
[8] LINX London Network. [online] Available at: https://www.linx.net/about/our-network/ [Accessed 1 May 2019]

about the role infrastructure plays in the production of the digital expanded space of East London?

3.3 Summary of Methods

In summary, the research is structured around four psychogeographically-inspired drifts, which were organised using the online site CODED GEOMETRY and carried out in East London. The four drifts were conceptualised as a fragmented mapping of a single location. The drifts involved two key strategies; 1) Exploring East London in a performative way which estrange the participants from the everyday, making the familiar unfamiliar and encouraging a re-imagination of the space of the city; 2) A fictioning, or mapping, of the experience of the drift through performance writing.

Dewsbury's (2010) 'Performative, non-representational, and affect-based research' methodology was used and adapted to gather data and present the experience of the drifts. The methodology involves being directly engaged within the performative event, developing what Dewsbury describes as a portfolio of ethnographic 'exposures'. A research diary, photography and sound recordings were used to record the experience.

The key overarching interest of the research was how space is produced and the role digital technology plays within this. Dewsbury's performance methodology was selected as a research tool, so as not to disrupt, influence or lead the experience of the participants in the drifts. It was selected as a means of including within the data the situated, embodied, non-representational and affective experience of participating that cannot be registered from the position of observer. The experience of the drifts produced complex ethnographies of place, and the research develops a performance writing style, compiled from notes and images collected whilst walking, to present the experience of being-in and moving-through the landscape as performance inserts throughout the thesis. These texts are used within this thesis in contrast to the analytical texts, setting up a dialectic between theory and practice.

4 Virtual space

4.1 Practice Insert 1 – ‘In The Cleansed Spaces the Wild Flowers did Grow’

<<< IN THE CLEANSED SPACES THE WILD FLOWERS DID GROW >>>

Hackney: A Drift through the Gentrified Zone in Search of the Digital City
Wednesday 15th October 2014

Phycogeographers

Nostalgia is a dangerous condition when drifting alone through a territory once loved. Ghosts rise up and swirl from every step. The years of evoking and fathoming the memory can blind the vision. The present is haunted by past possibilities. Though maybe it's in these failed possibilities and fetishised pasts that we can find alter-futures, other possibilities, alternative paths and new visions. I drift Hackney knowing my weakness, my overarching longing for the secret freedoms this place once offered me. Yet Hackney seems a perfect place to start a drift in search of the digitally expanded city. It is in Hackney's derelict warehouses, once temporary autonomous spaces sprayed with day-glow paint, that the media start-ups eventually settled. The 90's squat parties, artist communities and radical politics Hackney once embodied, sowed the seeds of its own destruction. The beneficiaries of psychogeographical knowledge are the estate agents. They understand more than the radical urbanist the value of an edgy radical artistic ambience. Maybe future psychogeographers will refuse to publish their books and put their energies into the construction of a negative ambiance. One that turns a territory into a hostile zone for middle England yuppies who like to disguise their privileged heritage behind a hipster beard and moustache. 'HIPSTER, YOU FOOL NO-ONE'. Creative Industries, Digital Shoreditch, Silicon Roundabout. You are the direct decedents of the suited YUPPIES that supported Margaret Thatcher. Liberal political views find it easy to align themselves with the liberal economics that exclude all but the most wealthy.

The history of East London has always been one of change as different communities arrive and transform the area; the Chinese and the Huguenots of the 18c, the Irish and Jews of the 19c and in the 20c, waves of immigration from the Caribbean, Bangladesh and Kurds from Turkey. The Hipsters and gentrifiers are different. They assert an exclusionary homogenising force over this territory. Their presence dominates and cannot be ignored as we meet outside Hackney Town Hall. However, our ultimate mission is to investigate a more profound transformation, the fracturing of space-time by digital technologies that I can sense but not locate. We set out on our quest to find the digital city with no real preparation or plan. Not entirely sure what the digit city is or where to look to find it.

Town Hall Square

There has always been something quietly desolate about Hackney's Town Hall Square. A sad desperation permeates the air. It has now been nearly 20 years since our first experiments. Discovering cracks in the homogenising urges of the globalised city, cracks from which autonomous spaces could emerge and take form. Not forms laid out in advance with a 0.1 fine line pen and a ruler, or on the screen of an Apple Mac running the latest CAD programme and not the forms of spontaneous order resulting from the free unfettered reign of the market.

TREACLE PEOPLE, STICKY LIKE US. A squatted social centre whose boundaries refused to remain fixed. Bleeding, draping onto the pavement, making advances, threatening to breach Mare Street and disrupt its rational flow of traffic. Maybe if the fluoro swirls radiating out from this building had reached the road they would have rushed at speed throughout the whole system like a narcotic entering a vein. WEST; Whitechapel Road, Aldgate roundabout, off into the city towards the West End. EAST; A11, A12, the Eastway, M11 link road, eventually the A406 North Circular, enclosing and surrounding the whole city. A spreading wave disrupting the dominance of the privatised motor vehicle. TREACLE PEOPLE, STICKY LIKE US! I never did understand the reference to a failed 90's ITV children's programme, though I have a strong intuition that I may yet discover a new vein of treacle somewhere in this abandoned mine.

DRY MOUTH, hairs standing on the back of my neck, heart palpitating, panic setting in. FLASH BACK. This was the vulnerability. The weakness I was most worried about. Slippage into romanticised psychotropic nostalgia. I squint and try to locate this former building but its location eludes me. Was it the newly sandblasted former Salvation Army building with its stone laid in 1910 by the Mayor of Hackney T.E. Young Esq B.A.F.R.A.S. that now houses Hackney Councils Human Resources and Organisational Development offices? Or has the whole building vanished? Eradicated from the collective memory. Rebuilt as the Baxter's Court Wetherspoon. One of the few pubs in the area that still has a working class and black clientele. I decide that it must have been where the spoons now stands.

The stories of Hackney's total gentrification are over-rated. On this the radical left and the Labour dominated council collude. Buildings like the Hackney Picture House act as a distraction. Your eyes are guided to the colour washed lettering, red, violet, blue, you watch like a voyeur the affluent clientele eating and drinking through the large windows, but if you can extract your gaze from this inviting spectacle the square has not rid itself of the abject. The Hackney Gazette features a full page image of a young bearded white man with the headline, 'the face of Hackney'. This is the face they want you to see. The true face of gentrified


HACKNEY
PICTUREHOUSE

Hackney remains poor and black, but less visible than ever before. Where are the late night shebeens and the pubs with pool tables blaring out the latest Jamaican dancehall tunes? Only the extreme acts of being public, like the 2011 riots, have the ferocity to puncture the mediatised facade Hackney has constructed.

Black and White zebra print wheelie shopping bag, NHS walking stick with large hard rubber stopper lie prone on the marble memorial bench dedicated to the memory of Robert Levy, a 16 year old teenager, stabbed intervening to help a younger boy caught up in a gang conflict. A seated man must be in his 60's, brown and mauve dog print baseball cap and black sunshades. A gravelly laugh reveals a good nature and bad teeth as his companion arrives. A middle aged black woman with a lumbering gait. Checked jacket, black leather flat cap with braids extending from the back, black tracksuit bottoms with a white stripe meet a pair of brown leather sandals. These two occupy the space more fully than anyone else in the square. They take ownership of the space around them in a way the occupants of the large wooden tables, visible through the windows of the Hackney Picture House, could never do. The wealthy rent their small patch of table for the price of an expensive meal or a drink and understand without any explicit rules that their occupation is temporary. This couple occupy with such conviction that it would take an intervention from the police to evict them. They are here for the day.

The Hackney Picture House has had its own turf war in the process of gentrification. At the southern end of the building is a grand semi-circular 'balcony' with neoclassical columns sheltering a set of semi-circular stone steps, which lead up to the now defunct, grand entrance of the former Hackney Library. The balcony is ornately decorated with a large stone plaque displaying an image of St Augustine's Tower draped on either side by stone garlands of flowers and fruit. As rents rise people are displaced. This decorative entrance provided temporary shelter for a growing number of homeless people. Mattresses arrived and a small community took residence under the protective stone coat of arms. The stench and filth of human existence did not fit the image Hackney council was fostering. This wasn't the fashion quarter, Broadway market, Dalston circus, Shoreditch. This was a fissure in the gentrification narrative in plain view of the Town Hall and it needed to be erased. Vanished, swept away, steam cleaned, and boarded up. Battleship grey boards now deny access; Defensive architecture at its most crass.

It's now 13 years since the last stand. The intoxicated and ill-conceived occupation of the town hall on the last night of the Samuel Pepys. The Samuel Pepys had been the central hub of Hackney's alternative scene. The hang out of political radicals, squatters, artists, junkies and lowlife. It functioned as an information point between different networks. The Samuel Pepys was to a whole sub-culture what Facebook has become for everyone, but without the relentless data mining, advertising and surveillance. Though it is now clear that there was


Disabled
badge

surveillance in the form of the undercover police officers embedded in the activist movement. I think I once saw Mark Kennedy in there with my mate. In the Samuel Pepys you would find out when the next illegal warehouse party was happening, where to find cheap or free accommodation, listen to Hackney's local bands and get handed flyers for the next anti-criminal Justice Bill demo or Reclaim the Streets event. I liked it out the back, up on the roof. This was Basque territory. The roof would have a permanent haze of pungent dope smoke and a mixture of Spanish and Basque voices. I was told that most of this crew were here dodging Spanish National Service and others were on the run from the Spanish authorities for their political support for the Basque National Liberation Movement. I never found out if this was true. However, throughout the 90's there was a strong link between Hackney's alternative sub cultures and those of Bilbao, Barcelona, and Kreuzberg in Berlin. The Samuel Pepys was to the borough of Hackney what the cockroach nest was to Baxters Court's Wetherspoon kitchen. It was clear to those in the Town Hall that any attempt at regeneration would have to involve eradicating this source of resistance. The fatal blow came from an unexpected direction, the National lottery and Sir Alan Sugar in the form of a £17 million project to refurbish the Hackney Empire.

The Samuel Pepys is currently an under-used popup café called the Stage Door.

Wayland Court

Like a surrealist joke, a gnome dangles from a swing tied to the 'Disabled Badge Holders Only' sign marking the edge of the pavement and the entrance to Wayland Court. This feels like a coded sign, like those shoes you see dangling from telephone wires in Glasgow, but somehow with a wry and somewhat psychotic sense of humour. There is pathos in this dangling figure and it creates conflicting emotions within me. It instantly makes me want to laugh, yet the sort of laughter that is tinged with a deep and heavy sorrow.

Burroughs once wrote, "I don't spot junk neighbourhoods by the way they look, but by the feel, somewhat the same process by which a dowser locates hidden water. I am walking along and suddenly the junk in my cells moves and twitches like the dowsers wand: 'Junk here!'"

I know the Wayland Court estate well. I have lived here a long time and have a neighbourly relationship with many of its residents. It is a small estate. One 17 story tall block which stands like a counterweight for a line of Oak trees that radiate in a carefully planted row across London Fields. Adjacent to the tall block are two low-rise blocks of maisonettes forming an L shape that encloses a carefully manicured central garden. Many of

the elderly residents of this estate are the original residents who first took up residence when the estate was opened in 1959. The estate is well ordered and maintained by a residents' committee straight out of JG Ballard's imagination. A strict hierarchy exists, maintaining the ultimate power of the committee chairperson, Di; an elderly but powerful woman, always flanked by her vicious husband Alf. This is a ruthless dictatorship that ensures a beautifully ordered, clean, well maintained estate. Everyone knows who to contact if there is a problem and everyone knows the consequences of disagreeing with her.

As I enter the estate I am taken by an unidentified feeling of unease. There is a strange ambience. My nervous system is on high alert and my mind is drawn to that quote by Burroughs. There is nothing tangible, just a feeling, a mixture of threat and excitement. As I walk past the tower block a group of shifty characters are huddled behind the wall, waiting, with perspiring desperation. A row kicks off. A guy in a dirty denim jacket and a baseball cap holding a can of Tenants Super yells at a woman sitting on a concrete step wearing clothes two sizes too large for her emaciated body. The voices are Eastern European, probably Polish or Lithuanian. I walk further into the estate and see two of the local residents, standing defiantly, eyeing up the Junkies. This is an unusual alliance. Elizabeth with her bright red died hair and Shell holding the leads of a pair of pit bull terriers. Elizabeth is what you would describe as a Cockney, must be going on 70, always immaculately turned out, hair flaming red in a 60's film star style, still likes to get down to Bethnal Green for a drink on a Friday night, heart of gold, looks after the estates' elderly residents, decks out her balcony in Union Jack bunting for any national occasion, Royal wedding, Jubilee or World Cup and is always the first to know when anything is happening on the estate. Shell is the tough matriarch of one of the maisonettes and Di, the chairperson of the residents' committee, has repeatedly tried to obtain an ASBO to stop her kids sitting in the communal gardens drinking alcohol and smoking weed. Her front door is still boarded up after her estranged husband attempted to smash it through after being released from prison for bottling a bloke in a drunken argument. As I approach Elizabeth says, 'The Junkies are back', Shell joins in with a tirade about the polish couple leaving needles in the den. The den been a circular structure of trees and flowers in the centre of the communal garden, under which the younger estate kids play and hide and Shell's dogs like to entertain themselves by chasing each other around and through. Whilst we stand there the dealer turns up, a tattooed hipster on a white folding bike with the arrogance of a public school boy. I don't let on that I've seen him before and know he lives on one of the canal boats at the bottom of Broadway market. He looks straight through his hostile audience and caries on his trade. Less than a minute and he's off again. 'Why don't you lot just fuck off back to where you came from and stop leaving your shit all over the place. We know what you're up to, you junky pieces of shit!", a shrill voice yells from behind us. We all turn our heads to see Courtney, Shell's 19-year old daughter, standing at the door wearing a pink velour tracksuit.

Her boyfriend, an Irish traveller with gingery blond hair, cut into a strict side parting, is stood beside her with an amused, slightly stoned look on his face. The junkies make a quick exit. I assume to find somewhere less hostile to shoot up their shit. This is spatial politics at its most complex.

Ellingfort Road Road, London Lane

Ellingfort Road and London Lane in the 90's. A brightly painted metal flower reaches out towards the sky from one of the gardens of this row of condemned Victorian terraced houses. Corrugated iron curtains hide rotting wooden sash windows. The road is littered with vans in various states of rust and roadworthiness. A 60's bus is parked under the railway arches at the end of the street. Multi-coloured fabric stretched across its windows and wood smoke drifting from a chimney cut roughly through its roof. You can enter the front door of one house and hours later find yourself on the third floor of a house halfway down the street from where you entered. Holes cut between buildings at various levels. This is a labyrinthine warren. Each room has a different ambience, but a constant pulsating, paranoid, trance inducing bass forms the dull background to the whole street. This is where many of the anarchos who hang around the Pepys live and where many of the after parties take place.

The collective occupants of Ellingfort Road and London Lane have proven themselves adaptable and have aged with their streets. By the end of the 90's, sensing the end, as the council started to wield its regeneration scrubbing brush, the occupants of Ellingfort Road and London Lane brokered a deal with the local authority to have their houses refurbished under a £2.5 million programme, transferring the ownership of the properties from the council to a housing association and guaranteeing cheaper rents for the former squatters.

Walking down Ellingfort Road today it is quiet. There is the occasional pulsed sub-bass rumble of a train passing over the railway arches at the far end of the street. The vans and busses have gone, but traces of the alternative community are still present. In the refurbishment, the houses were converted into flats and ginnels created, connecting the street to flights of metal stairs that run along the back wall of the houses providing access to the flats. The ginnels are gated with elaborate sun design metal work. Old habits die hard, old furniture and potentially useful finds are hoarded at various spots along the street. A set of small children's clothes, toys and books are carefully laid out along a wall with a small hand written note, 'Please Take'. The refurbished paintwork, now over ten years old is starting to look a little shabby. It gives the street a warmth not experienced on many of the other streets in this area.

The road surface is covered with a tarmac containing a large aggregate that emphasises a lone rectangular smooth black patch, the length of a car and a half, marking number 18 Ellingfort road. An angular warehouse with heavy metal security shutters, adjoining the Chinese cultural centre and facing the refurbished terraced houses. WARNING: Premises protected by Key security. Black scorch marks on broken granite curb stones mark the only traces of the night, in 2011, that Hackney's myth of hermetic gentrification was shattered in a festive celebration of looting and burning. A red Mazda MX5 sports car burnt with a ferocious heat on this spot as rows of hooded and masked rioters barricaded the street with burning wheelie bins, holding the police from entering the road, whilst number 18, then a Carhartt clothing warehouse, was looted.

'Looting is a natural response to the unnatural and inhuman society of commodity abundance'. The Situationists wrote in their 1965, 'The Decline and Fall of the Spectacle-Commodity Economy', as a response to the Watt's riots. A Word document Find and Replace of this text, substituting the word 'Watts' for 'Hackney', still provides the best analysis of the 2011 riots.

'The Hackney rebellion was a rebellion against the commodity, against the world of the commodity in which worker-consumers are hierarchically subordinated to commodity standards. Like the young delinquents of all the advanced countries, but more radically because they are part of a class without a future, they take modern capitalist propaganda, its publicity of abundance, literally. They want to possess now all the objects shown and abstractly accessible, because they want to use them. In this way they are challenging their exchange-value, the commodity reality which molds them and marshals them to its own ends, and which has preselected everything. Through theft and gift they rediscover a use that immediately refutes the oppressive rationality of the commodity, revealing its relations and even its production to be arbitrary and unnecessary. The looting of Hackney was the most direct realisation of the distorted principle: "To each according to their false needs" — needs determined and produced by the economic system which the very act of looting rejects.'

I leave Ellingfort Road under the train bridge, emerging at a lockup for those large transparent blue bottles that sit upturned on water coolers in city offices. Deep blue fortified fences, topped with circular loops of razor wire, surround the compound. A high white painted wall, marking the boundary between this compound and the next, is adorned with bright blue graffiti, neat and expertly sprayed lettering spell out ACAB.


ACAB

Broadway Market

Sandstone paving slabs thread with a seam of rust on wet days give the impression the street is literally paved with gold. These must be the most expensive paving stones in the borough.

Broadway Market. Pages of printing ink have been expended on this tiny strip of road, psychogeographers, journalists, travel writers, travel writing psychogeographical Journalists. I could spend pages writing about the transformation of this street, about the battle to save Tony's Café, its occupation and reopening, the construction of a Reclaim the Streets scaffolding pyramid on the roof as a final barricade. I could write about the eviction of Spirit, the last Afro-Caribbean food store in this area, but all this has already been historicised. I could write about the less known aspects of the street, the drive-by shooting at the Broadway BBQ kebab shop, or the hostility of the locals in the pre-gentrified Cat and Mutton pub with its UVF graffiti in the toilets. But what actually interests me is the street now. The post-hipster, less fashionable Broadway Market, inhabited by Hackney's second generation media workers. This has been the epicentre of Hackney's gentrification and looking through the cafe windows I can see huddles of fashionably dressed, late twenties early thirties, mainly males, working on laptops. Transient desk space and free WIFI for the latest kickstarter company, all for the price of an Americana. Crowd sourced capitalism with a social conscience. This is my first real trace of the digitally expanded city.

La Bouche a delicatessen and café midway down the street exemplifies the mixture of socialising, networking and entrepreneurialship espoused by the denizens of Broadway Market. Faces looking out through street fronted windows, large bowls of salad on show, a long central table hosts small groups having meetings, leaning endlessly over laptops. Glowing Apple Mac logos illuminate the table, large white mugs containing lattes with elaborate leaf patterns jostling with the anodized aluminium laptops. This street is a mirage within a desert of poverty and 60's social housing. Stepping back from La Bouche there is a punctum in the dizzying spectacle. The meeting point of Broadway market and Benjamin Close marks the border between two worlds. Looking at La Bouche from this angle, the old-world charm of the Victorian, faux Parisian, frontage is dwarfed by Welshpool house, a 17 storey 1960's tower block. The bench style seating lining the outside of the café is mirrored by the public benches on Benjamin Close, currently occupied by a group of teenage boys, mixed black and white, but all wearing dark winter coats with their hoods high over their heads. Here two groups collide in a conspiracy of mutual indifference. Neither group acknowledges the existence of the other. Two alternate existences share the same space. The boundaries are understood by everyone but never acknowledged.

Fucking noises!

Fucking. FUCKING NOISES!

I don't know. I don't fucking know.

Do you know. DO YOU FUCKING KNOW.

Cos I don't know.

FUCKING NOISE.

Fucking. FUCKING noises!

If care in the community means anything, other than a budgetary cost cutting exercise, its exemplified by the community of outcasts who gather at the benches at the end of the cycle path that leads through London Fields to Broadway Market. A mixed and wretched community, black and white and varied in age. A tall thick set masculine white woman with cropped short greying hair and a hard face, wearing grey jogging bottoms and hoodie, sits with her arms raised like the outstretched wings of some large bird, elbows resting in the cuffs of a pair of NHS crutches. An ageing and overweight black man wearing an oversized blue raincoat with the hood covering his head and resting on the rim of a pair of large angular black wraparound sunglasses, face contorted as though he is concealing a segment of orange. A White man, probably in his forties, though it's difficult to tell, drugs, alcohol, lack of food, and I suspect time on the streets have prematurely aged him. Hair shaven leaving long tails of unkempt and natty hair at the back, a crushed green plastic bottle of White Ace held between dermatitis inflamed hands.

These benches create a permanent space of sociality for those with drink, drugs and mental health problems. It is a space that enables the isolation of the flat, bedsit or hostel to be overcome. A meeting point to drink, get wasted and forget. Temporary self-medication from the permanent cycle of return that traps the mind, crippling it, refusing to allow it to move on from some unspeakable trauma. The dark thoughts that keep you awake at night fuelling self-loathing. The voices. 'FUCKING NOISES', I overheard a young black man yelling to himself. Whilst

there are tensions here, sudden eruptions of violent shouting, the occasional fight, you also witness tenderness, a caring for each other, even splitting cash to buy more booze.

Hoardings have been erected behind the benches. Toilets are being constructed to service the masses that come every Saturday to shop in Broadway Market's boutiques, restaurants, and wine bars. The plywood boards have been treated with a translucent green varnish that emphasises the grain. Hovering above today's bench dwellers, is an oblong block of opaque green paint carefully rolled to mask the still visible graffiti, ACAB. I stand and stare. There is an obvious comic reference here to Mark Rothko's abstract expressionism. On these large boards, it does produce the kind of melancholy Rothko's paintings can inspire. But as I contemplate this accidental work, I locate the melancholy not in the abstract but the cypher. This acronym ACAB has punctured my drift at various locations. ACAB - All Coppers Are Bastards. An antipolice slogan used by working class hooligans and football Ultras from both the far left and far right. It is a sign of working class resistance and rebellion. Contemplating the oblong of green paint, with the graffiti lettering visible only when the light hits it at a certain angle, I start to think about disappearance. I had read the stories of Hackney's gentrification. But what I have witnessed on this walk is deeply entrenched poverty and desperation. The artists, squatters and anarchists have either left, moving gradually further east, or managed to do a deal like the community from Ellingfort road and London Lane. The incumbent wealthy, parade Boadway market, flamboyantly sitting outside bars and restaurants, drinking expensive wines and cocktails. The alcoholics, junkies and teenage gangs have a parallel flamboyance, gathering at public benches or in huddles on estates waiting for dealers; but the shops, cafes and pubs that serviced the working-class community have all gone. The means by which Hackney's working class community can be public have been erased, like the lettering in this piece of graffiti, but the community itself remains for now. The threat of raising council rents to more closely reflect market value, combined with caps on housing benefit, hangs like a looming spectre across this community.

Wild Flower Meadow

Leaving the benches, the green hoardings and the stale smell of piss that hangs in the air over this corner, I head into London Fields and the newly planted Wild Flower Meadow. I walk along one of the mud paths that form a small network through the wild flowers. The flowers are in bloom casting an array of colour, corncockles, poppies, Japanese anemones, oxeye daisies and a mix of wild grasses, dance in the gentle wind. Insects are in abundance. A wild eyed but serious man in his early 20s with an incredibly tall body, that seems to bend far too much as he walks, stops to talk to me. 'Ey! Av you noticed there's no bees? But there's loads of wasps. These flowers are being pollinated by WASPS! Nature is cleaver like that. Upset the balance and it finds another way'. I nod politely in agreement. There have been local campaigns over the summer about the use of the weed killer glycophosphate on the meadow. I feel a heavy bleakness sink within my body. How long before an economic weed killer is used to eradicate the residents that are no longer economically viable in this area.

Invisible Geographies

It was only leaving this territory of ghosts, memories, and bitter class clearances, that the digitally expanded city revealed itself, if only partially, within in a coincidental alignment of moments. Heavy vibrations amplified through the riveted panels of an iron bridge, a heady exaggerated perspective of tracks and electricity cables raced towards their vanishing points, a yellow brick post war tenement block topped with transmitters and a collection of satellite dishes pointing to the sky. On the balcony below, a man wearing an embroidered white dashiki shirt and trousers with a kufi cap, probably a recent arrival from West African judging from his gestures, tended pink flowers. I tried to take a photograph, but the metadata reveals more than the blurred and ill composed image.

I was passing the centre of the bridge that connects platform 1 and 2 of Hackney Central overground station when my attention was grabbed by the heavy low rumbling that reverberated through my feet and deep into my body. The Iron railings had been covered with painted grey chipboard blocking my vision and forcing me to rise up onto my toes to look over the high sides of the bridge. I watched the slow movement of yet another freight train passing below. Containers with strange names and a very particular pallet of colours that have become familiar by the frequency and repetition of their passage through this area heading north from Tilbury docks or London Gateway;

HAMBURG SUD, HAMBURG SUD, MAERSK, MAERSK, EVERGREEN LINE, MAERSK, COSCO, HAPAG-LLOYD, P&O/Nedlloyd, P&O/Nedlloyd, MAERSK SEALAND, COSCO, HAMBURG SUD, P&O/Nedlloyd, COSCO, HAPAG-LLOYD, EVERGREEN LINE, HAMBURG SUD, MAERSK.

Tilbury to Birmingham, Bristol, Coatbridge, Felixstowe, Leeds, Liverpool or Manchester.

London Gateway to Birmingham, Liverpool, Manchester, Leeds and Coatbridge with an ad-hoc service to Bristol.

The African guy was cleaning his already spotless balcony with sharp whip-like movements of a white cloth that seemed to amplify the weight of transmitters only metres above his head emphasising the oversaturation of his pink flowers which struck me as anachronistically out of place in October. A sudden bright spark illuminated the bridge and burnt a temporarily blind spot onto my retina as the connecting strips of the pantograph arm momentarily disconnected and reconnected the Freightliner engine to the suspended power line. The ionised air and the visceral presence of the usually invisible electricity made me recall a passage from Gilbert Simondon's On the Mode of Existence of Technical Objects in which he meditates on the relationship between a traction engine and its varied geographic environments;

'The traction engine doesn't simply transform electrical energy to mechanical energy; it applies electrical energy to a geographically varied world, translating it technically in response to the profile of the railway track, the varying resistance of the wind, and to the resistance provided by snow which the engine pushes ahead and shoves aside. The traction engine causes a reaction in the line that powers it, a reaction that is a translation of geographical and meteorological structure of the world'.

The freight train continued to rumble below my feet as I contemplated the invisible electrical mapping produced by the train within its connected power line, not just of the physical environment but also rendering social and economic flows. The added weight of commuters at certain times of the day moving in one direction then the other or the alterations in the power line between commuter trains and freight. Either the electrical substation or the train itself must be engineered to counter the effects of these cartographic fluctuations, but if the system could be hacked at that key point a form of rhythm analytics could be extracted revealing the invisible geographies produced in the power lines through the socio-economic and environmental rhythms of the train network.

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      Focal length :  4.2mm  (35mm equivalent: 145mm)
      Digital Zoom : 4.996x
      Exposure time: 0.0006 s  (1/1721)
      Aperture     : f/2.2
      ISO equiv.   : 32
      Whitebalance : Auto
      Metering Mode: pattern
      Exposure     : program (auto)
      GPS Latitude : N 51d 32m 49.38s
      GPS Longitude: W  0d  3m 26.10s
      GPS Altitude :  23.71m
  GPS Dir offset = 1574
  GPS info dir:(dir has 14 entries)
      GPSLatitudeRef      ="N"
      GPSLatitude         =51/1, 32/1, 4938/100, 32/1, 4938/100, 0/1, 4938/100, 0/1, 3/1
      GPSLongitudeRef     ="W"
      GPSLongitude        =0/1, 3/1, 2610/100, 3/1, 2610/100, 18065/762, 2610/100, 18065/762, 8/1
      GPSAltitudeRef      =00
      GPSAltitude         =18065/762
      GPSTimeStamp        =8/1, 39/1, 5/1, 39/1, 5/1, 0/1, 5/1, 0/1, 140537/833
      GPSSpeedRef         ="K"
      GPSSpeed            =0/1
      GPSImgDirectionRef  ="T"
      GPSImgDirection     =140537/833
      GPSDestBearingRef   ="T"
      GPSDestBearing      =20574/59
      GPSDateStamp        ="2014:10:15"
```

The endless freight continued to flow below me. The physical length of these trains is impressive but can induce an overwhelming sense of monotony. My mind started to contemplate wider invisible geographies. The African man had disappeared indoors, but I'm sure that my mobile phone was secretly communicating with the mast that is sited above his flat. My limited knowledge of the mobile phone network informs me that these masts constantly broadcast their system identification code and mobile phones are set to listen and check in, even when they are not in use.

I had a moment of epiphany. The digitally expanded city that I was searching for and had failed to locate is, just like the relationship between the train and its power cable, in part invisible. It is not accessible through the normal human sensors, only disclosing its presence through its absence. Those moments of low signal or lack of WIFI connection. As I walk Hackney I have been enmeshed in an invisible geography of machine to machine communication, I have been creating invisible disturbances in a whole host of systems, casting data shadows, a personal trail of involuntary meta-data has accompanied my walk as my phone broadcasts and receives its secret messages, revealing my presences in an unseen cellular network and creating fluctuations within the electromagnetic fields that I pass through. My phone has communicated with satellites, in order to log the location and altitude of my photograph and layered WIFI zones have been mapped and charted, routers contacted and interrogated. It now becomes clear that the digital devices and interactions that form the tangible aspect of the digitally expanded city atop a vast invisible infrastructure. The Industrial revolution transformed space through the construction of impressive iron and steel structures. The digital revolution overlays space with an invisible geography of electromagnetic signals.

4.2 Analysis

This chapter focuses on Drift 1, In The Cleansed Spaces the Wild Flowers did Grow, which for brevity will be referred to as the Hackney Drift. The Hackney Drift was carried out from 2pm on the 15th October 2014 and consisted of six participants. The starting point was Hackney Town Hall. There was a gender split of two females and four males, all aged between 30 and 50. Perhaps more significantly all the participants could be considered to be part of a cultural and political sub-culture. The psychogeographic nature of the event and its online organisation resulted in a distinctly political and specialist group. Most people had participated in drifts before and had a conceptual understanding of psychogeography. The majority had prior personal knowledge of Hackney Central and its radical history, and all identified in some way with anti-gentrification politics. I initially felt that this contributed to some of the weaknesses and failures of the drift's inability to consider the digital aspects of the event and the continued dominance of the anti-gentrification narrative throughout the drift. However, in retrospect, I feel that the non-digital outcomes of the drift can elicit some very useful findings for researchers interested in the digitally expanded city. My literary review suggested that the city is already inscribed by circuits of digitality and the drift's difficulty in locating 'the digital' was a key factor in expanding later drifts to confront digital aspects of East London more directly.

The Hackney Drift followed, as closely as possible, the walking technique originally devised by the Situationists International and focused on the general ambience and social and political background of East London. The Hackney Drift functioned as a grounding exercise, clarifying some of the methodological decisions, defining the particular form of psychogeographical practice, exploring what such practices can reveal about the digitally expanded city and identifying the required future adaptations and experiments.

This chapter answers the research question *What can a psychogeographical art practice reveal about how spatial subjectivities are produced in the digitally expanded city?*

It answered the research question by examining the key processes observed through which the participants actively produced a spatial understanding of Hackney Central. The Hackney Drift revealed three significant[9] processes, that can be divided into the following categories:
1) Memory and perception; 2) Spatial narratives, 3) Affect. Each of these categories will be explored individually.

[9] I observed other processes: for example, the role played by economics in driving change within Hackney, global currents in inner-city land use and traditional politics (local and national). I have focused on those processes that seemed unique to the practice of psychogeography.

Memory and perception investigates the way individual and collective memory conflicts with perception in bringing the past, as an active force, into the present to form new spatial understandings. Spatial narratives focus on the role collective storytelling plays in constructing spatial meaning and key sites in the landscape. Affect investigates how the environment was felt, expressed and performed. These concepts played an interrelated role throughout the drift. I will explore them individually, while bringing them together, to argue in favour of a spatial model that describes subjective and intersubjective spatial understanding as an active force, formed by and forming the physical landscape in continuous mutual becoming.

4.2.1 Memory and Perception

On the steps leading up to the entrance of Hackney Town Hall, I waited for the drift to start. The first participant arrived, a close friend who I had known since 1997. After the usual greetings and pleasantries, the conversation quickly shifted to the subject of the Samuel Pepys pub. This was a known conversation, one which had been rehearsed and refined a number of times before. Our shared history included being present at this venue on numerous occasions in the past. The pub had been a strategic meeting point for Hackney's '80s and '90s counterculture but had been demolished in the early 2000s as part of a major refurbishment to the Hackney Empire theatre. The council-led regeneration programme also included building a central library on the opposite side of the Town Hall Square, building the Baxter's Court Wetherspoons pub and renovating the former library building that now houses the Hackney Picturehouse cinema. The council's regeneration plan intended to bring 'café culture' to the Town Hall Square.

As we stood on the Town Hall steps recounting memories, the former site of the Samuel Pepys had been replaced by a pop-up café, which was selling cups of filter coffee. As more people arrived the stories of the Samuel Pepys became more exaggerated and gained an air of nostalgia. This was especially true when it came to the story of 'the last night of the Pepys', the last night before the pub was finally closed. It saw large numbers of people turn up; too many to actually get into the pub. The crowds grew outside, initially blocking the road before targeting their anger at Hackney Council by breaking into the Town Hall and partying on the balcony until riot police eventually managed to evict them.

As this story moved on to other stories, I was aware of how they were being exaggerated and transformed in the telling. A process of mythologising the past emerged at a number of

significant sites along the walk, most significantly the Treacle People squat, along Ellingfort Road and outside the boarded-up shop that had formerly been Tony's café on Broadway Market. Personal memory, nostalgia and the mythologising of locations were not intended as a significant aspect of a drift in search of the digitally expanded city, and in many ways were antithetical to my research method. However, the force through which these issues presented themselves amongst this small group of walkers made me question what work these practices were carrying out in producing our understanding of this location. What could ubiquitous and mobile research learn from taking such practices seriously?

I will start by thinking about personal memory through the problem posed by this single location, the corner of Mare Street and the Town Hall Square in Hackney, where the Samuel Pepys Pub once stood and the Stage Door café now currently resides. There are clearly differences between my very personal memories, the wider cultural memories that mark the significance of this place for members of the drift and the current experience of the site.

Personal memories are not easy to articulate. They are not internalised like a picture book copy of events or movie ready to be replayed. They are embodied and multi-sensorial. Personal memories have an interesting relationship to site. They are uprooted from their original location, and they can be accessed away from the site within which they were experienced. However, a personal understanding of a site cannot be separated from these memories. Standing outside the Stage Door café, I perceive the space as it is now. I perceive the current location, a reality at odds with personal memory which remains present and plays a role in the experience. My personal experience of the Stage Door café has to negotiate three key aspects; the material reality of the café, my perception of the cafe and my memory which contains past personal experience and wider cultural narratives and histories. This location brings these parameters into relation to produce my understanding of the site.

One of the fundamental aspects of experience is that it is embodied and takes place within a particular time and space. Personal experience has a direct relationship to the material reality of a location. Before continuing, I want to define exactly what I mean by the material reality of a site. I will use the term 'material' within my thesis in the classical sense of the matter that forms the world and the bodies within in it. I am linking the term 'material' here to reality to express a particular form of reality – the reality of the material world that exists beyond observation or perception. It is important to state that material reality is one form of reality, but not the only form of reality, and this will be explored later in my thesis. The fact that the café's material structure has undergone fundamental change is the core factor that made this location a significant discussion point at the beginning of the drift, prompting

storytelling and the recall of personal and collective memories. It also points to an important feature of material reality that I want to emphasise at this early stage. Material reality is in a constant process of change, sometimes because of human interaction such as the café's major renovation and at other times through non-human intervention, such as weathering or fire. I am therefore using the term 'material reality' to define the matter that forms the world and the bodies within in it that exist beyond perception or observation and is in a constant process of change.

Perception differs fundamentally from material reality. My personal perception of the café, with its modern industrial plate glass windows with industrial dark grey frames and a pop-up café interior intended to suggest shabby chic through its use of reclaimed wooden pallets and scaffolding planks, will always be an impoverished version of the café's material reality. The material reality contains the totality of the matter that forms the space; perception, on the other hand, is formed from a series of fragmented sensible impressions of material reality. Personal interests, desires and bodily necessity drive perception. It is not surprising that I perceive the large windows as impressive as I explore the café from the street outside, or that once I enter the space the bar area becomes significant whilst the ceiling and walls do not. There is a clear difference between the material reality of a space and the perception of that space. In fact, perception deviates substantially from the material reality being perceived. All sensory organs are synchronised to orientate and enable movement through space, driven by the pursuit of wider desires and interests. This purposeful perception drives what is perceived. The close-up of a face as we assess someone's intentions, hands as they count out change after a purchase, the position of chairs and tables to ensure we do not trip, the smell of coffee, the decision whether to buy, the general ambience of the space to decide whether to stay for a while. A central aspect of perception is that it takes place in the present. Perception is the mode of being in a space in the present. Perception cannot take place in the past or in the future, although it is acknowledged that the sensible impressions from one present are passed forward to the new present, enabling a continuity of orientation.

Perception includes not only sensible impressions, but also pre-conscious affective impressions. Perception is entangled with affective responses, which can be difficult to articulate. Being affected by a space can be said to loosely relate to feelings such as, but not limited to, anxiety, fear, calm or safety. The Stage Door café produced an affective response in me that deterred me from entering. I cannot articulate why. My response was not an intense feeling such as fear or anxiety, but it was a tangible affective response and one that was integral to my perception of the space. Those who study perception and those who study affect may object to my conflation of the two. However, the experience of the drift suggests

that they are experienced simultaneously and have a very real impact on how the city is experienced. I do not claim that sensible impressions of space and affective responses to space are the same thing, but rather argue that from the perspective of walking the city these two modes of experience fuse together to form unified pre-rational impressions. Within my thesis I will use the term 'perception' to describe the embodied sensible and affective impressions of material reality formed in the present. Perception is just as real as material reality. Sensory experience and affective responses are real even if they do not have a material form. The reality of perception is most clearly demonstrated in its ability to guide actions. I am deterred from entering the Stage Door café because of my initial perception of the space. I rationally override such pre-rational, or intuitive responses, yet perception plays a very real role in how the city is experienced and understood. The centrality and subtlety of sensorial and affective experience in forming a personal understanding of city space opens up many opportunities for mobile and ubicomp research. How can spatialised affective computing be employed and realised to intervene in a user's perception of the city space?

My perception of the Stage Door café was instantly at odds with my memory of the Samuel Pepys pub, whose location it now occupies. Neither the interior nor the exterior retain any of the features from the original building. This disjunct between perception and memory that had resulted from the complete transformation of the physical space prompted my own personal memories of the venue but was also the fundamental reason why the drift began by memorialising the former public house. I will explore the spatial work done by storytelling later. Here I wish to focus more closely on personal memory. I have numerous intimate memories of events that took place at the Samuel Pepys, and these continue to play a role in how I feel and understand this particular location. Perception and memory are clearly related phenomena. Memory would not exist without first having been perception; however, memory and perception present themselves in conflict in relation to the Stage Door café/Samuel Pepys pub. Perception presents me with a sensory response to the current material reality of the space, whereas memory draws me back to the past, to previous experiences. To understand this dichotomy between perception and memory we have to consider the site in relation to temporality: the present as it is perceived and memories that refuse to depart. It is important to make it clear that memory does not reside in the past. Memory resides in the present, and is coexistent with perception. Memory and perception are distinctly different but are relational. This relationship was described by the philosopher Henri Bergson in his seminal book *Matter and time,* quoted here by Gilles Deleuze,

> The past and the present do not denote two successive moments, but two elements which coexist: One in the present, which does not cease to pass, and the other in the

> past, which does not cease to be but through which all presents pass. (Deleuze,1988, p.59).

This is the paradox demanding to be resolved by the experience of the Stage Door café/Samuel Pepys pub. We can only ever be in the present. Memory draws from the past but is always experienced in, and confronted by, the present. The present, on the other hand, is immediately doomed to pass the moment it is perceived. A central process in the production of my personal understanding of the Stage Door café is the coexistence of my memories of the space's previous incarnation as the Samuel Pepys pub, with my perception of the material reality of the space as it is experienced in the present.

As I consider my own memories of the Samuel Pepys public house, contemplating experiences, some events dominate my recollections. Not all memories are equal. Some memories emerge with a greater intensity than others. I sense that many have simply been forgotten. The strongest and most dominant memories are the ones that rise up and present themselves like spectres in the present, refusing to remain in the past. Considering what gives these memories their force, I can identify two key features. First, they involved strong emotional involvement: for example, when a friend became ill and nearly died. The second is the number of times these memories have been recalled, either privately or told publicly as stories. Repetition is an essential aspect of the force through which memories present themselves in the present and play a role in the production of a personal understanding of a space.

Spatial memory can be likened to the formation of a pearl. Natural pearls are formed in the early stage of an oyster's development, when an irritant finds its way into its shell. In memory, the irritant represents any significant event that demands recall. In the oyster, the irritant acts as a nucleus around which a protective sac is formed. Over the nucleus, layer upon layer of a fluid, called 'nacre', is secreted until a lustrous pearl is formed. Each recall of memory brings that memory into the present, forcing it to confront the present, and in doing so transforms the original memory, forming a polished coating of recall around it. The more a memory is recalled the more it is transformed into a solidified polished pearl which only partially represents the original event at its core.

The repetition of the past in the present through memory recall furnishes locations with personal psychic contours. We have previously seen how the two aspects of perception and affect play a role in the pre-rational experience of space. Personal memory also plays an important role in forming a personal understanding of space. The Samuel Pepys pub/Stage

Door café is just one example of the way that the personal meaning of a location emerges as a relationship between perception and memory. The Samuel Pepys was not unique, and this process is relevant to any location of which a walker has a pronounced memory. A location that none of the walkers had any prior experience of, for example the London Fields wildflower area,[10] has itself become memory both through the experience of the drift and also through its recall. Much of the perception experienced drifting between significant locations has now been forgotten, whereas some sites became significant either because of the intensity of their affective perception or because of personal memory or because another walker shared their own personal stories.

Bergson's formulation of memory and perception map very closely onto the experience of memory and location while walking the changing landscape of Hackney. Bergson's interest was in the development of a subjective concept of time. At the core of his project was the problem of memory and its relationship to the perception of the present. Bergson suggested that in each moment of the present we experience a split between a present that passes and a past which is preserved. To explain how the past can continue to survive in the present he describes two distinct forms of memory, which he names spontaneous memory and habitual memory. Spontaneous memory is formed from representations of the past, and is therefore virtual, whereas habitual memory engages with the image of the present. For Bergson, duration is a relation between the virtual, which is pure memory, and the actual, which describes pure perception. The actual can be said to be the experience of matter in the present, whereas the virtual is the recall of the past, through memory, into the present. The present, therefore, is always experienced through the split relationship between the actual and the virtual.

The virtual describes the memories of a location and the actual represents the material reality of that location as perceived in the present. Such a formula allows a personal understanding of a location to be understood as produced simultaneously by the past still active in the present and by the material reality of the location; in this respect space can be said to simultaneously have two faces, one material and one ideal. Following this formulation, my understanding of the Stage Door café is a relation between the virtual and the actual. It combines my perception of the material reality of the space, its actual space, with my personal memories, my virtual space. My understanding was formed through the dissonant feedback created between the space's virtual and actual qualities. In this respect, we can state that the reality of the Stage Door café must encompass both the actual and virtual aspect of that location.

[10] See Practice Insert 1 – 'Wild Flower Meadow' Pg. 72.

I shall now look closer at the way collective storytelling played a significant role in providing meaning to locations along the drift.

4.2.2 Spatial Narratives

The telling of personal memories became an important aspect of the collective storytelling, which provided key sites with social meaning. The experience of the drift suggests that the collective sharing of memories is part of an important process of assigning meaning to locations within the urban environment. While personal memories play an essential role in forming an individual understanding of space, the public telling of personal memories helps to form social relations between the group of walkers and particular locations along the walk. Key sites took on an added significance as a result of these stories; the performance insert that introduced this chapter was structured to express these stories and locations. The telling of personal memories breached the boundary between a private and a public understanding of space. Recounting personal stories functioned as a tool to orientate the drift into forging cultural and political relations between the members of the drift and contemporary Hackney. At the very beginning of the drift, the exaggeration and mythologising of 'the last night of the Pepys' narrative, alongside nostalgic reminiscences of '90s psychedelic squat parties and Reclaim the Streets activism, forged a collective politics with which to critique the contemporary Hackney that confronted us. As I stated earlier, the participants in the drift already constituted a coherent subcultural and political grouping, and these narratives confirmed and strengthened the group's cultural and political bonds, rooting them in significant physical locations. I will define the storytelling that gives meaning to a particular location for a particular cultural group as minor spatial narratives.

Minor spatial narratives assemble people around particular representations of space, representations that may be at odds with the more dominant narratives of the very same location. This was particularly apparent in relation to the Hackney Town Hall Square. The closure of the Samuel Pepys and the demolition of the Treacle People Squat were part of a major regeneration of the Town Hall Square, a transformation which presented us with a narrative of the social and economic renewal of the area that envisaged the development of a continental café culture and promoted Hackney as a centre of art, culture and fashion. I will define this creation of an official narrative which has been used to promote Hackney since the 2000s as a major spatial narrative. Major spatial narratives are the 'official' narratives of a particular location. They come with promotional budgets and have access to the media. For example, Hackney Council regularly use their own newspaper, *Hackney Today*, to promote their vision for the borough. Housing developers promote these narratives using text and

images on the hoardings that surround their new developments. The drift suggests that the physical space of Hackney can be shown to be overlaid with a major spatial narrative that competes with a multiplicity of minor spatial narratives formed by sub-groups, such as those taking part in the Hackney drift.

Major spatial narratives are transformative of the material reality of urban space. Major spatial narratives are translated directly into plans, diagrams and designs which are used by developers, engineers and construction workers to transform the material reality of urban space. More subtly, they contain transformative logics which attract investors and property developers and ultimately reorganise populations through rising rents and house prices etc. The Samuel Pepys pub was transformed into Stage Door Café. The Treacle People Squat became the Baxter's Court Wetherspoons. Broadway Market was refurnished with expensive paving slabs and the old Hackney Central Library was reconfigured to become the Hackney Picturehouse cinema.

As buildings and sites are removed and the urban landscape is transformed, the stories attached to these locations are in jeopardy of being similarly removed. Minor spatial narratives are more than just stories; they are also social relations that form and maintain social groups. Once that material anchor, the building or site, is removed, there is a danger that the community associated with a site becomes invisible and forgotten. The intersection between major spatial narratives and the multiplicity of minor spatial narratives becomes a politics of space, symbolised at the time of the drift by an anti-gentrification politics. Minor spatial narratives can create tensions with the minor spatial narratives of other groups, for example the territorial claims of local street gangs such as the London Fields Boys and their rivals from Fellows Court or the conflict between the fans of neighbouring football teams such as Arsenal and Tottenham. The drift equally revealed conflicting spatial narratives, such as the conflict between residents of the Wayman Court estate and the 'junkies' who use the more oblique corners of the estate to deal in and take heroin. The junkies had subtly marked their territory with shoes dangling from the telephone cables and a gnome placed on a signpost at the entrance to the estate; these signs and symbols stood in contrast to the elderly residents who proudly display their Hackney in Bloom awards to define the pride they take in the estate.

Major spatial narratives have the power to dominate and transform urban space, yet minor spatial narratives are not eradicated in the process. They continue to form and be formed through personal and collective storytelling, and can themselves manifest change to the material reality of urban space. Their minor status does not command the vast resources and

manpower available to major spatial narratives, yet their presence can leave traces. The manicured central garden of the Wayman Court estate was one example, but so was the prolific A.C.A.B graffiti that was a significant signifier along the drift. A.C.A.B is an acronym well understood to mean 'All Coppers Are Bastards', an ephemeral signifier sprayed throughout the borough and the sign of a minor spatial narrative that had the power to bring large assemblies of people into the streets during the 2011 riots, leaving behind traces in the landscape such as the oblong of fresh tarmac that marked the site where a red Mazda MX5 sports car was set ablaze on Ellingfort Road, or more significantly the demolition of the Carhartt factory outlet adjacent to it. Minor spatial narratives assemble publics around particular representations of space, representations that may be at odds with the more dominant narratives of the very same locations. Locations contain a multiplicity of minor spatial narratives and the interaction both between minor spatial narratives and major spatial narratives forms a complex spatial politics that can leave traces, sometimes ephemeral and sometimes more permanent, within the urban landscape.

On the morning of the drift, three flags were flying above Hackney Town Hall: on the left, a white flag containing the coat of arms of the London Borough of Hackney; on the right, a blue flag containing a circle of twelve five-pointed yellow stars symbolising the European Union; in the centre, immediately above the Town Hall's entrance, the red, white and blue of the Union flag, the national flag of the United Kingdom. Hackney's major spatial narrative itself is embedded within a larger hierarchy of spatial narratives symbolised by the flags fluttering atop the Town Hall. Major spatial narratives can be said to have different levels. In Hackney's example these include the borough (Hackney), the city (London), the nation (UK), the political union (EU). Each level itself is involved in complex political relations. In the 1980s Hackney notoriously chose to fly a red flag rather than the Union flag. The decision by the Town Hall to fly the Union flag and the European Union flag at the time of the drift looks in retrospect, in the period of Brexit, to be a stronger political statement than it appeared at the time of the drift.

Major spatial narratives are the 'official' narratives of a particular location, and have the power to transform the material reality of that location. They represent one level of a hierarchy of competing 'official' spatial narratives which extend from the local to the global and beyond. They have the power to affect the levels above them, but can also be affected by the levels below.

Although this first drift purposely avoided a focus on technology, mobile phones were used to research key sites. For example, the site of World War Two bomb damage on Broadway

Market and the garland crest over the entrance to the former Hackney Library. The results of these Google searches flowed directly into the general conversation and the construction of spatial narratives. The blurring of collective storytelling and Wikipedia results was seamless. The use of mobile technology was so habitual that it is only in retrospect that these moments of phone use appear relevant, testifying to the invisibility of mobile technology in the experience of walking Hackney Central.

One model for understanding social spatial praxis that emerged from cultural geography and gained some traction in HCI was the division between virtual and real space. The concept of the virtual was popularised in cultural geography in the mid-late 2000s to describe the separate field of space formed online or through digital simulations such as Second Life (Johnson, 2007). The initial incarnation of the virtual and real represented a binary distinction between the digital and the physical; however, as de Souza e Silva (2006) has pointed out, the disconnect between physical and digital spaces was eroded by the rise of location-aware mobile devices, an observation confirmed by the Hackney Drift. Farman extends the concept of the virtual to argue that 'Mobile stories […] demonstrate that embodiment in digital culture is produced through a dynamic interplay between virtuality and materiality' (Farman, 2015, p.107).

Jason Farman's 'Stories, spaces, and bodies: the production of embodied space through mobile media storytelling' (2015) hints at a potential model that I would like to develop further to help describe the dynamics of spatial production experienced in participating in the Hackney Drift. Farman's paper focuses on, '…the ways we use media to tell the social stories of a place and, ultimately, orient our bodies toward (or against) the narratives of these locations' (Farman, 2015). Spatial narratives and storytelling emerged as a core feature of the Hackney Drift through the collective experience of the event and were then further refined through the representation of the event in performance writing. Although mobile phone use was a minor aspect of the Hackney Drift, the social relations produced between the participants and the locations within the city have some shared features with Farman's observations. There are also some important differences, such as the fluidity and lack of fixity found in the spoken narratives produced by the participants in the drift. I want to focus on a key point of similarity between my own and Farman's observations. Farman notes that

> The medium-specificity of a mobile phone allows multiple stories – which can often tell conflicting narratives about what a space means – to be layered onto a single spot. On This Spot, as it relates to the ecology of mediated narratives that surround it, demonstrates that the body's relationship to a space (and the stories of that space) is

> engaged through practices of layering. Embodiment in such sites is produced through engaging the multiplicity of narratives communicated (Farman, 2015, p.106).

There are strong parallels here with my own observation that locations contain a multiplicity of social meaning and that spatial narratives play an important role within their production. Farman suggests that such layering is emblematic of 'the virtual' (Farman, 2015). He defines the virtual by providing a quote from Friedberg's writing on postmodern cinema,:

> The concept of the virtual provides a crucial ontological distinction here; from the Latin virtus, for strength or virtue, virtual is defined as 'of, relating to, or possessing a power of acting without the agency of matter; being functionally or effectively but not formally of its kind. (Friedberg, 1993, p. 204)

I have already described how major spatial narratives, for example Hackney Council's regeneration plans, play a forceful role in the transformation of the material reality of the borough. The concept of the virtual provides a useful tool to describe the very real force ephemeral narratives can wield over physical matter. The virtual, understood in this context, is not a simulation of the world, as in virtual reality, but an integral and active aspect of reality. The virtual is no longer inherently linked to the digital. It is embodied by the inhabitants of the city and describes the intersubjective flow between people. The virtual is in mutual dialogue with material reality, being formed by it and forming it. Farman draws attention to the similarity between mobile storytelling and Deleuze's analysis of cinema. He acknowledges this link again through a quote from Friedberg:

> I've chosen the word virtual here and not simulation to avoid the Baudrillardian connotations of a simulacrum unhinged from its referent. Henri Bergson uses the term virtual in *Matter and memory* (1896) to distinguish between perception and the 'virtual sensation' of memory. Gilles Deleuze takes up the term to describe the two sides ('actual' and 'virtual') of what he deems the cinema's 'crystal-image'. (Friedberg, 1993, p. 204)

The concept of the virtual correlates with the experience of the Hackney Drift both in the relationship observed between the material reality of a space and major and minor spatial narratives and in my personal relationship with the Stage Door café/Samuel Pepys pub.

Deleuze develops Bergson's concept of duration through a study of cinema. Deleuze felt that on some rare occasions film could allow us to see the process of time. He refers to these moments as the crystal-image. The crystal-image is formed through the indivisible unity of

two other forms of image, the actual and the virtual. The virtual image is subjective, in the past, and recollected. The virtual image as 'pure recollection' exists outside of consciousness, in time. It is always somewhere in the temporal past, but still alive and ready to be 'recalled' by an actual image. The actual image is objective, in the present, and perceived (Totaro, 1999). For Deleuze the crystal-image describes those moments when the internal circuits between the virtual and the actual are so intertwined that they can no longer be separated. I would argue that Deleuze's model of the virtual and the actual provides the basis for a convincing description of urban space thrust into movement through a constant process of construction and reconstruction: a model of urban space which acknowledges that multiple temporalities are experienced simultaneously. A core observation made while taking part in the Hackney Drift was the changing nature of the area. The friction between the actual space of a location perceived in the present and the virtual recollection of the location was important to the formation of spatial subjectivities. Like Deleuze's crystal-image, the most significant locations were the locations within which the virtual and the actual were so intertwined that they could no longer be separated. The drift took place during a period of rapid change which made it impossible to separate the concept of space from one of change. Bergson contrasted time with space and ultimately sided with time to the detriment of space.[11] I would suggest that change should be understood as a fundamental property of space.

The change experienced on the drift was not just the changing nature of the physical environment in contrast to memory but also the construction of spatial narratives that changed our understanding of key locations. I found that the sense or understanding of a location was transformed by the spatial narratives that emerged while walking.

In his writing on the crystal-image, Deleuze discusses Herman Melville's *Moby-Dick*. He describes the split between the visible face of the ship from above and the opaque face of the ship from below water, in particular the engine room. He contrasts the visible order of the actual ship with the virtual conflicts between the engineers' perversity, the captain's obsession and the secret revenge of insurgent blacks which eventually actualise to disrupt the visible order of the ship as a fight breaks out. Here we are presented with the actual ship which contains a multiplicity of virtual antagonisms that actualise to alter the nature of the ship in itself. Not only is the space of the ship shown to be in reality formed from both an actual and a virtual aspect but the multiplicity of the virtual has the power to become actual change. Deleuze's discussion of virtuality here differs from that of Bergson in that rather than

[11] Bergson considered space as stasis and contrasted it with the new that he viewed as a property of time. As Doreen Massey notes, 'Bergson's overwhelming concern with time, and his desire to argue for its openness, turned out to have devastating consequences for the way he conceptualised space. This has often been attributed to a classic (modernist?) prioritisation of time.' (Massey, 2005, p. 21).

centring on the past, on memory, the virtual is broadened to include the perverse desires of the engineer, the increasingly erratic obsessions of Ahab, and future hopes for racial equality. I would argue that Deleuze's description of the virtual in *Moby-Dick* can be extended to the urban – the city experienced as a coherent physical space but belying a multiplicity of virtual hopes, desires, fears and antagonisms. The virtual understood in this way enables it to become a device to describe the complex web of subjective and intersubjective forces that form spatial subjectivities. Virtuality extended in this manner is not restricted by a looking back to the past but, Janus-like, also extends to the future. Memory and storytelling present themselves as an active force that brings the past into the present to either maintain or disrupt space. Psychogeography plays a role in this process both by uncovering minor spatial narratives and by actively producing new spatial narratives that have the potential to effect real spatial change.

4.2.3 Affect

'Looking at La Bouche from this angle the olde-worlde charm of the Victorian, faux-Parisian, frontage is dwarfed by Welshpool House, a seventeen-storey 1960s tower block. The bench-style seating lining the outside of the café is mirrored by the public benches on Benjamin Close, currently occupied by a group of teenage boys, mixed black and white, but all wearing dark winter coats with their hoods high over their heads. Here two groups collide in a conspiracy of mutual indifference. Neither group acknowledges the existence of the other. Two alternate existences share the same space. The boundaries are understood by everyone but never acknowledged'.

The meeting point of Welshpool Street, Benjamin Close and Broadway Market marks a distinct border. This was instantly felt by the members of the drift, and we stopped at this precise intersection as the members of the drift responded to the perceptual shift in ambience that occurs at this location. This was a spontaneous stop which immediately provoked discussion. We all recognised a distinct change but could not immediately articulate why. There is a clear psychic border here created by a number of factors. Broadway Market is a single street of shops, the majority of which used to belong to Hackney Council and were sold cheap at auction to a single developer as part of the council's regeneration plan. The shops were renovated, strip lights and acrylic signs removed, making them more 'authentically' Victorian. This spot marks a break in the flow of shops that line Broadway Market. It reveals another world, that of the large council estates, hidden from any other point along the street. We started to rationalise this shift in ambience, for example the shift in use of materials from brick to concrete, the shift in scale from two-storey Victorian buildings to the high-rise of Welshpool House, or the distinct difference between the clothing of the people who occupy the benches outside La Bouche and the benches on Benjamin Close. One person suggested

that this was probably the site of a World War Two bomb, a theory confirmed through a quick Google search on a mobile phone. What was obvious from the experience was that our analysis was secondary to our recognition of a sudden shift in ambience. We stopped, then rationalised.

One of the original aims of Debord's conception of psychogeography was to uncover the city's psychic atmospheres which encourage or discourage entry to certain areas of the city. The response of the drift at this particular location suggests that psychogeography is a good practice for uncovering such affective responses. Sadler (1998) has noted that 'Embodied experiences, emotional and affective relations were central to the SI revolutionary project' when developing the strategy of psychogeography. Richardson (2015) and Powell (2009) have both noted that psychogeography's 'zones of distinct psychic atmospheres'(Chtcheglov, 1963) can be seen as presaging contemporary discussions around affect and emotional geographies (Pile, 2010). At the same time, ubicomp's interests in affective computing can be seen as sharing common ground with psychogeography's research into affective landscapes.

Brian Massumi, in his 'Notes on the Translation of Deleuze and Guattari's *A Thousand Plateaus*', gave a useful definition of affect, stating:

> AFFECT/AFFECTION. Neither word denotes a personal feeling (sentiment in Deleuze and Guattai). L'affect (Spinoza's affectus) is an ability to affect and be affected. It is a prepersonal intensity corresponding to the passage from one experiential state of the body to another and implying an augmentation or diminution in that body's capacity to act. L'affection (Spinoza's affection) is each such state considered as an encounter between the affected body and a second, affecting, body (Deleuze, G. and Guattari, 2005, p.xvi).

Despite this definition, the term 'affect' is often used interchangeably with 'emotions' and 'feelings'. Eric Shouse (2005) has suggested a very useful distinction between affect, emotions and feelings. He suggests that a feeling is a sensation that has been checked against previous experiences and labelled. It is personal and biographical because every person has a distinct set of previous sensations from which to draw when interpreting and labelling their feelings. He contrasts this with an emotion, which is the projection or display of a feeling. Unlike feelings, the display of emotion can be either genuine or feigned. Emotions are therefore a performative act, communicating to others, or hiding, our internal state. He defines an affect as a non-conscious experience of intensity; it is a moment of unformed and unstructured potential. Affect cannot be fully realised in language because affect is always

prior to and/or outside of consciousness (Massumi, 2002, p.29). Within my thesis, 'affect' is defined as the ability to affect and be affected. It is always between at least two bodies acting upon each other. It can, therefore, never be fully articulated from the singular perspective of one of those bodies. It always resides in between bodies; however, the experience of being affected flows into feeling, emotions and conscious representation. The experience of Broadway Market can be described as an affective border – an experience that ultimately involved affect, emotion, feelings and rationalisation. The group came to an automatic halt. Some pre-conscious perception spread through the group, expressed through feeling and emotion, and rapidly became conscious analysis through discussion.

I would argue that affect can be considered to be analogous to the 'psychogeographical relief' poetically described by Debord as 'constant currents, fixed points and vortexes which strongly discourage entry into or exit from certain zones' (SI, 1981b). From a psychogeographical perspective, affect can be considered to be the bodily experience of spatial relations that fall below the level of conscious thought but rapidly present themselves as feelings, emotions and conscious analysis that have a fundamental impact on how space is experienced and produced. Affect is experienced through a combination of spatial dynamics and joint social dynamics that create a very real psychogeographical relief within the spaces of a city. Affect is not simply a personal experience; it is a relation between people and people or people and things.

The experience of the Hackney Drift suggest that a city has interlocking and intertwining affective zones that are felt and interpreted in different ways by the various inhabitants of a city. A consideration of Debord's psychogeographical reliefs as affect allows their potential as insight into spatial body relations to be taken seriously within research. The practice of psychogeography made the participants of the Hackney drift aware of their affective response to different ambiences along the drift. This suggests that psychogeographic walking practices are a very useful site of research into the affective qualities of urban experience. The practice of the drift, because of its strategy of promoting heightened awareness through defamiliarisation, suggests invaluable possibilities for research interested in the potential of affective geography and spatial affective computing. It is also suggestive of a more radical form of design that utilises urbanism, architecture and ubiquitous computing with affective zones as its goal.

The affective experience of particular locations affected the participants of the drift. This created unspoken behaviour in the group. For example, we all stopped walking together. Sites such as Benjamin Close had a heightened or intensive affect on the group. Such intensities

become part of how space is understood and remembered. Affective zones can be described as a virtual landscape of intensities that forms an embodied sensible mapping of a landscape. The virtual space of subjective and intersubjective understandings of space can be said to have two aspects that loosely align to what have been termed respectively non-representational and representational practices in cultural geography. The first is the virtual intensity of being affected by a site. These are the pre-rational feelings that emerges from an encounter and can influence how an individual or group responds to a location. The second is the virtual representations or ideas, such as memory or spatial narratives, which have the potential to inspire future action.

If the concept of the virtual and the actual is extended to the spatial we can say that space has an actual face that is limpid and perceptible and a virtual face that is opaque and constructed from a multiplicity of personal and collective spatial narratives, desires and affective experience. Space should then be considered simultaneously actual and virtual. But this should not be confused with a clear dichotomy or an argument for a return to a Cartesian divide between mind and body. The virtual and the actual are not opposed to each other; they describe two different aspects of spatial reality. The actual is material and can be perceived, whereas the virtual is a force that plays an active role in the experience of a space. The digital in this context is not separate from other forces that form spatial subjectivities. Digital representations and digital narratives are embodied alongside non-digital representations and narratives. My literature review defined the digital as including ontics, aesthetics, logics and discourse. A model based on the actual and virtual aspects of space allows the digital to be approached from the perspective of the interplay between all four aspects, from the impact of the ontic qualities and organisational logics of digital technology on actual space to the virtual subjectivities formed through digital media's affective aesthetics and spatial narratives.

It is important to note that actual space itself can become virtual as exemplified by the way the perception of the drift has itself either been forgotten or has become representation through memory and spatial narrative. It is also possible for the virtual to become actualised: for example, the way spatial narratives have fundamentally altered the material environment. I have previously described how both major and minor spatial narratives can actualise.

I have outlined how space can be shown to have two aspects: an actual space that is the material reality of a space and can be experienced, and a virtual aspect that is a multiplicity of personal and collective feelings and narratives that play an active role in the experience of space. I have described how the actual can become virtual and how the virtual can actualise. It is important to point out the role of process. Process describes the internal circuits of

exchange between the virtual and the actual. There can be no movement between the virtual and the actual, and therefore no change without process. Process describes those human and more-than-human activities that keep the urban environment in a constant state of construction. Process describes the shift from a major spatial narrative of regeneration to laying new paving slabs. It describes how minor spatial narratives of racism and police brutality brought large groups of people together into a riots festival that transformed shop fronts. Process also describes how perception and memory are brought together to form a new understanding of a location. Process describes the social practices (Lefebvre, 91, p.38) and the more-than-human processes[12] that form interlocking circuits between the virtual and the actual to produce space.

Psychogeography as a practice intervenes both by making spatial narratives visible as narratives and by creating new narratives. Its value from the perspective of research is that its practices make these usually mute processes of spatial production accessible to critical analysis. The collaborative nature of the drift exposes part of the process through which social relations between individuals and locations are formed. From the perspective of spatial HCI, mobile and ubicomp representations engage directly in both major and minor spatial narratives. Whether overtly, through apps such as Google Maps or forms of mobile storytelling (Farman, 2014), or covertly via the digital representations embedded within ubicomp. The question raised by the Hackney Drift is: how do digital representations impact on spatial narratives and what role do they play in forging personal and collective meaning within urban space? Of course, there can be no singular answer to this. It will depend on the exact nature of the spatial technology, where and when it is employed and the representations it embodies. This research suggests the development of a critical theory that takes mobile and ubiquitous computing seriously as a medium that actively intervenes in the production of new virtualities and actualities to transform the space of cities. Psychogeography has shown that its practices are ideal for exploring the processes through which virtualities are produced and experienced. It therefore presents valuable possibilities for researchers interested in the interventions mobile and ubiquitous computing make within spatial narratives. Chapter 6 – Potential Space - will explore this proposition in more detail by researching the role played by the digital representations embodied by the popular mobile app Google Maps.

[12] Non-human processes that produce space can include a cities flora and fauna, its weather but also mechanised systems such as traffic lights and turnstiles.

4.3 Implications for Ubiquitous and Mobile Computing Research

My research explores the digitally expanded city using a psychogeographical art practice. The Hackney Drift did not in itself utilise or focus on any particular technology. It did, however, attempt to be open to the complex process through which those participating constructed an understanding of Hackney Central. I have described some of the most prominent processes of spatialisation experienced along the drift, a spatialisation that can be shown to occur at multiple levels, from individual memory and perception to collective storytelling and mythmaking that runs in contrast to dominant spatial narratives, to the affordances of physical locations and the felt nature of a location's ambience. The flags on top of the Town Hall and the incessant flows of container trains expose the fact that the unique local qualities that define Hackney are not isolated or immune from currents of spatialisation from multiple levels such as the national or global. In effect, the drift exposed a small subset of the complex multiplicity of forces at work in forging spatial subjectivities. One of my research questions asks: *What are the critical and philosophical implications for future ubiquitous and mobile computing research raised by the findings of a digitally expanded psychogeographical art practice?* The answer is to help to develop a critical understanding of the complex processes of spatiality that form the context into which ubicomp and mobile computing intervene. My analysis has found in the experience of the drift an argument for thinking spatial subjectivity from the perspective of what Deleuze describes as the virtual and the actual.

The discourse around spatiality has played an important role in the developing field of Human Computer Interaction (HCI) and the growing disciplines of mobile and ubiquitous computing. The foundational text of spatial HCI, and one that continues to be influential within the field, is Harrison and Dourish's (1996) 'Re-p1ace-ing space: the roles of place and space in collaborative systems'. Here I will critically review the concept of 'space and place' by contrasting it with the findings of the Hackney drift and argue in favour of the alternative model of the virtual and actual. There is a large body of literature debating the meaning of place and space in cultural geography (Moores, 2004; Castells, 2000; Massey,1993; Meyrowitz, 2007; Dovey, 2009). A full review of the debates on space and place in cultural geography would be outside the scope of this thesis. I will restrict my argument to the use of space and place within the HCI disciplinary context, which remains relevant to spatial research in ubiquitous and mobile research. Harrison and Dourish were interested in the development of computer-supported cooperative work (CSCW), and their study focused on the use of spatial models and metaphors to aid understanding and communication in collaborative systems. Their paper was critical of the use of spatial metaphors, such as the desktop, office, corridor etc. They argued that what property designers were searching for, through the use of spatial metaphors, was not rooted in the concept of space, but rather in a

mutually held and mutually available cultural understanding of behaviour and action that they defined as place. They outlined a clear dichotomy between the two concepts of space and place. They stated that 'Space is the structure of the world; it is the three-dimensional environment in which objects and events occur, and in which they have relative position and direction' (Harrison and Dourish, 1996).

They contrast this definition of space with a definition of place, in which they state that

> Physically, a place is a space which is invested with understandings of behavioral appropriateness, cultural expectations, and so forth. We are located in "space", but we act in "place". Furthermore, "places" are spaces that are valued. The distinction is rather like that between a "house" and a "home"; a house might keep out the wind and the rain, but a home is where we live. (Harrison and Dourish, 1996)

So for Harrison & Dourish, space is described as the opportunity, whereas place is the socially understood reality. A single space can function as multiple different places at different times, depending on how it is used.

> …the same location – with no changes in its spatial organisation or layout – may function as different places at different times. An office might act, at different times, as a place for contemplation, meetings, intimate conversation and sleep. So a place may be more specific than a space. A space is always what it is, but a place is how it's used. (Harrison and Dourish, 1996)

Within the wider HCI community, space and place remains one of the dominant models for understanding spatial interaction. Space is presented as a fixed metric, a given abstraction upon which social practice produces place. Space enables orientation; up, down, near, far, whereas places are constituted by the social norms which provide a space with clues to the appropriate behaviour expected in a location. Harrison & Dourish themselves provide the useful example of the bedroom window in which it is appropriate to sit peering out, but not to sit outside another person's window peering in. Place is a set of socially constructed norms and expected behaviours, which provide a space with cultural meaning.

Considering the space/place dichotomy from the perspective of the Hackney Drift, it is clear that Harrison and Dourish expose an extremely important social process. They brought to HCI the importance of social practice in the construction of people's understanding of space. The Hackney Drift observed the process by which a cultural sub-group created, through discussion and storytelling, a unique sense of belonging. The drift furnished key sites with

social meaning, and I would argue that the affective borders that mark a shift in ambience also mark a territorial shift in expected norms and behaviours; in effect the borders between what Harrison and Dourish would describe as ‘places’. Whilst welcoming Harrison and Dourish's contribution to HCI, by introducing a socially produced understanding of space I want to turn to the findings of the drift that question some aspects of their space/place binary.

Harrison and Dourish wrote their paper ‘Re-P1ace-ing Space’ in 1996, and in many ways presaged the social turn within computer science that occurred at the end of the’90s. During this period developers and programmers produced environments for fixed desktop computing. The appeal of a spatial model that saw space as a fixed metric unit and place as the way such a space is used fitted neatly with the user/producer model that dominated computer science in this period. The space, in this case a digital environment, was developed by programmers and provided as a space to be used. The question that dominated was what sort of space afforded its users the ability to turn it into a place.

What was clear from the messy complexity of spatial relationships that emerged through participating in the drift was that space in the city is not a fixed entity. It was the changing nature of Hackney, exemplified by the Samuel Pepys pub, Broadway Market or the Hackney Picturehouse, that produced both a sense of loss and an anti-gentrification politics. Space itself, in this context, can be shown to have been socially produced. The drift took place at the height of a spatial change driven by the intersection of a number of processes, one of which was the changing nature of work in the borough. Many start-up businesses, particularly in the technology sector, but also in the cultural sector, such as microbreweries and nightclubs, were attracted to the area’s cheap empty factory units, abandoned buildings and artists’ studios, close to the City of London. These changes were supported politically and economically by Hackney Borough Council’s regeneration programmes, which displaced former social housing in favour of luxury housing developments attracting international speculation. Whilst the cultural, political and economic changes to Hackney that formed the backdrop to the drift are complicated, the important point to note is that space is itself in a constant process of change. Space is always engaged in a process of deconstruction and reconstruction. Even the preservation of heritage sites and historic buildings such as Hackney’s St. Augustine’s Tower involves regular maintenance to halt the dissolution of the buildings. The material reality of space which I defined previously acknowledges the important difference between personal and collective understandings of space and the material reality of a space. However, these two aspects are not a binary opposition but aspects of a single entity whose relational properties form complex feedback loops. Space is certainly formed from the interaction of physical and social processes, yet the complexity of interaction between these processes cannot adequately be described through a space/place conceptualisation. I have provided examples from the drift

of processes through which social and political relations transform the material reality of space at multiple levels, from the ephemeral storytelling of sub-cultural groups to the traces of graffiti and destruction of building from rioting, the organic regeneration through the changing nature of work and the planned regeneration of whole areas of the borough. The changing nature of material reality inevitably disrupts, tears apart and forms new social relations. The space/place dichotomy cannot, therefore, be viewed as a one-way relationship within which a static space is overlaid with social meaning to form a place. The qualities that Harrison and Dourish describe as 'space and place' are subject to social change and transformation through a multiplicity of processes and interaction between physical reality and social reality. While I maintain that Harrison and Dourish's work played an important role in placing social practice at the centre of an understanding of space, the dichotomy they define is too limited to describe the urban environment which forms the operational context of ubiquitous and mobile computing.

In 2006, Dourish reviewed the distinction between place and space in light of technical developments in the fields of wireless and mobile technologies. His paper 'Re-Space-ing place: "place" and "space" ten years on', can be seen as an important corrective to the interpretation of the relationship between place and space that predominates within HCI research. Dourish acknowledges the limitations of the conceptualisation of space in the 1996 paper. He argues that the rhetorical imperative of the period was to highlight the importance of the social production of place. He then highlights how space has been viewed within the HCI community as pre-given, and place has been seen as a social product. Dourish leaves his original formulation of place intact by stating that

> I would argue, the notion of "place" as explored ten years ago remains reasonably intact. By place, we attempted to express the ways in which our encounters with specific locales, our interpretations of their borders, and our behavioral responses draw on social and cultural foundations.

Place is defined by Dourish as space with social meaning, and a space may function as different places at different times. What the experience of the Hackney Drift revealed is that a location may have a multiplicity of social meanings at the same time. For example, the Wayman Court estate simultaneously holds different social meanings for the elderly gardeners and the junkies who occupy the same location. Both simultaneously contribute differently to the meaning-making of the location: the junkies by gathering together at specific times in the more liminal corners of the estate, and the gardeners through their diligent annual planning of floral colour and scent. Therefore, in Dourish's terminology it is important to point out that a space can contain a multiplicity of places at the same time.

Dourish's 2006 'Re-space-ing place' makes a valuable call to HCI researchers to reconsider the concept of space as equally an outcome of social practice as the concept of place. Place and space are both products of social practice, albeit different systems of practice (Dourish, 2006). What Dourish's reconsideration of his concept of space suggests is that HCI research should explore more closely how spatiality arises, and the role that technology plays in these practices. He states that

> […] there are many spatial systems and infrastructures at work simultaneously, so that Internet accessibility, mobile telephony, transportation systems, visual and physical access, and more, all result in different forms of spatial experience and that, when we talk about spatiality, we must think of the ways in which they occur together (Dourish, 2006)

The research questions posed in the introduction to this discussion asked: *What are the critical and philosophical implications for future ubiquitous and mobile computing research raised by the findings of a digitally expanded psychogeographical art practice?* An initial answer is that its artistic and performative practices place the research within the complex processes of spatialisation active in the city. The everyday personal, social, political, cultural and infrastructural processes of a location expose the unique but vital processes of spatialisation. Recognising and analysing the interaction between these different processes can make a valuable contribution to an understanding of their spatialisation within HCI research. As ubicomp and mobile computing insert themselves directly into the everyday life of the city it becomes increasingly important to understand such systems from the perspective of the spatialisation they produce.

Whilst Dourish's reconsideration of space is a valuable corrective, its reformulation of space as a social practice weakens the dichotomy he originally constructed between space and place, challenging the need for such a binary distinction. The new relationship between space and place presented by Dourish's 2006 paper relies on different systems of practice that are not clearly defined. This demands an answer to the question 'which social practices are spatial and which are placial?' How can we distinguish between the two? Space and place no longer represent the Heideggerian distinction between the Cartesian and the lived set out in the original 1996 paper and, in its conclusion, they do not constitute the hierarchical power dynamic that defined de Certeau's definition which Dourish reviews earlier in the 2006 paper. If place remains defined as space with social meaning, in what way are the social practices that produce space, such as changes in working patterns or the construction of new transport infrastructures, devoid of social meaning? The cafés of Broadway Market, such as La Bouche, have thrived predominantly as a meeting place and cheap desk space for young

entrepreneurs and start-ups who have not yet established permanent office space. The practices of the entrepreneurs, locally referred to disparagingly as 'hipsters', reflect the impact of digital logics on the area. These entrepreneurs are symbolic of the change in the nature of work in the area, and their presence has resulted in the proliferation of cafés and investment in high-speed internet and a transformation of the visual appearance of the street. It is difficult to disentangle, from this example, the social processes that have produced Broadway Market as a desirable cultural 'place' to work and the social processes that have transformed the 'space' of Broadway Market – its shopfronts, paving stones, and internet infrastructure. While the laying of paving stones is clearly a different social practice to carrying out an online business from a coffee shop, it is the strategic support from Hackney Council for the social practices of the entrepreneurs and start-ups that provided the finance and logistics for the laying of Broadway Market's unique paving. The placial practices of the entrepreneurs are an integral part of the spatial practices that led to the laying of the paving stones. In this example the creation of a space/place dichotomy occludes the processes that have transformed Broadway Market.

A common analogy provided to support the space/place division, one presented in the 1996 paper, is the analogy of the house and the home. A house is a space, but it becomes a home (place) through social practice. This analogy only stands as long as social practice remains at the level of superficial decoration, the choosing of colour schemes, carpets, furniture. The analogy fails if we think of other place-making that transgresses the integrity of the physical building – for example, constructing an extension to accommodate a new baby. Here place-making blurs into space-making. I would argue that from the experience of the Hackney drift that Dourish's reconceptualisation of space as produced through social practice is correct. However, attempting to define social practices as either spatial or placial potentially hinders rather than aids the understanding the complexity of urban space. This chapter of the thesis has used the experience and finding of the Hackney drift to explore how spatial subjectivities are produced within the digitally expanded city. It has made the argument for the consideration of subjectivities and intersubjectivities as a virtual space. Virtual space is not the opposite of actual physical space. The virtual and the actual are entangled within a mutual becoming. My core argument is not that concepts of space and place are fundamentally incorrect, but rather that, from the perspective of mobile and ubiquitous computing, it is with the lower-level concept of subjectivities and their associated social practices that these technologies aim to engage. Ubiquitous and mobile computing play an active role within both virtual and actual space. Its materiality impacts directly on actual space, and its core aims are to impact on the subjective and intersubjective experience and logic (social practices) of urban space.

Contrasting the findings of the Hackney Drift with the concept of space and place, this thesis has argued that the virtual and the actual, brought together by social processes, can more precisely describe the complexity of the relationship between social and physical understandings of space. I have argued that the digital should not be understood as a separate field of activity within the city, but as adding to the complex dynamics that produce the city. I have shown that the practices of psychogeography offer many opportunities to observe and reflect on these processes.

4.4 Adapting the Methodology

Personal memories and storytelling emerged as an integral practice of assigning spatial meaning to locations during the Hackney Drift. This raised a direct challenge to my use of Dewsbury's (2010) 'Performative, non-representational, and affect-based research' methodology. Dewsbury's methodology takes seriously the embodied and sensory experience of space. It demands that the researcher becomes attuned to their own affective response to different spatial environments. It also helped to focus my attention on the affective responses that flowed through the group at particular locations. However, the non-representational aspect of the method demands that the researcher brackets representations[13] of space such as memory, personal biography and spatial narratives. The practice of psychogeography is a social and collective practice. Memory, personal biography and storytelling were observed to play an essential role in the way participants actively produced Hackney throughout the drift.

The key disagreement with non-representational theory raised by the Hackney Drift is its avoidance of representation itself. This is reflected in wider approaches to representation, such as biography and memory and a consideration of the speculative potential of the imagination. Perhaps one of the clearest disagreements between the findings of my research and non-representational theory, particularly in the form outlined by Thrift's 'Non-representational theory: space/politics/affect' (2008) is biography. Thrift makes clear his position by stating that

> non-representational theory is resolutely anti-biographical and pre-individual. It trades in modes of perception which are not subject-based. Like Freud, I am deeply suspicious of, even inimical to, autobiography or biography as modes of proceeding.

[13] I am defining representation within this thesis in two distinct but related ways: 1) the process of meaning-making experienced on the drift. This is a process and includes storytelling; 2) cultural artefacts that present the world in certain ways and have an impact on how space is understood. This form of representation includes my performance writing.

> One seems to me to provide a spurious sense of oneness. The other seems to me to provide a suspect intimacy with the dead (Thrift, 2008, p. 7).

Spectres of the past refusing to leave the present formed a key factor in how the walkers made sense of the changing landscape of Hackney. It was only through personal memory and collective storytelling that locations revealed themselves as being thrust into motion and permanently under construction. Experience of the Hackney Drift suggests that memory and storytelling, often in the form of autobiographical reflection, emerge as a fundamental part of the experience, and these representations are important to the process of how people locate themselves and produce a particular terrain. Rather than providing 'a suspect intimacy with the dead', I would argue that the biographical narratives that emerged from the drifts were productive acts of retelling, and it is in the creative reformulation of the past in relation to the present, which is always accompanied by an actual or strategic forgetting, that makes these biographical narratives active in the production of space.

Personal representations of space also include wider cultural memory. Biographical narrative fictions and wider cultural memory developed through the performance of psychogeography can be seen not as monuments to the dead, but as active potentials bringing elements of the past into the present to act on the future in ways that can either be resistant to change or actively inspire it. Within my research, biography, personal memories, collective storytelling and politicised schemas can be seen as personal and collective representations of space that act as essential potentials in the social process that produces space.

My research develops Dewsbury's method by actively collecting personal and collective representations alongside affective and non-representational experience. My methodology incorporates Pink's (2009, p.38) argument for a sensory ethnography that pays attention to embodied representational practices such as memory and imagination.

4.5 Conclusion

This chapter has presented and analysed the results of one case study, the Hackney Drift, with a focus on the research question *What can a psychogeographical art practice reveal about how spatial subjectivities are produced in the digitally expanded city?*

The Hackney Drift purposefully estranged walkers from their everyday experience of East London, and this study found that its collective nature reveals processes that produce spatial understandings. The dynamics of the Hackney Drift, which took place at a period of rapid change to the area, exposed several processes that played a central role in producing the

spatial subjectivities of those who took part. It found that affect, understood as the sense or feel of a site, played an important role. Being affected by a site was not an individual response. It was an unspoken pre-conscious response that passed through the walkers, altering their behaviour. Examples include becoming quiet while walking through the wildflower garden or suddenly halting at Benjamin Court. This thesis argues that such intensities became part of how space is understood and remembered. I have described these affective zones as a virtual landscape of intensities that form an embodied sensible mapping of a landscape.

The Hackney Drift presented a clear link between personal memory and the creation of collective cultural memory in the form of spatial narratives. Psychogeography as a practice encourages participants to observe, experience, interpret and narrate the city. Spatial storytelling was one of the most noticeable aspects of the drift. Sharing spatial memories is part of an important process of assigning meaning to locations within the urban environment. While personal memories play an essential role in forming an individual understanding of space, the public storytelling and mythologising of sites helps to form social relations between people and particular locations. The Hackney Drift exposed friction between the spatial narratives produced by members of the drift and the dominant spatial narratives of Hackney as a borough. To explore the relationships between these conflicting narratives, within my research I have defined the storytelling that gives meaning to a particular location for a particular cultural or political sub-group as a minor spatial narrative. Minor spatial narratives assemble people around particular representations of space, representations that may be at odds with the more dominant narratives of the very same location. The official narratives of a particular location I describe as major spatial narratives. I have argued that major spatial narratives compete and conflict with a multiplicity of minor spatial narratives. Spatial narratives describe a spatial politics of antagonisms and competing claims to territory with the potential to transform physical space.

The drift found that from the perspective of walking Hackney it was impossible to disentangle digital processes from the complexity of wider spatial processes. The Hackney Drift suggested that people do not really distinguish between the physical and the digital in forming understandings of site through the use of mobile computing. Digital tools retreat into the background experience of the city. Ubiquitous and mobile technology become invisible in use. For example, on the Hackney Drift, searches about the old Hackney Library carried out using the internet on a mobile phone flowed into the general conversation and construction of the meaning of that location. No distinction was made between digital information and the information gathered by being in the location. The two complemented each other in the formation of the site. The digital in this context is not separate from other forces that form

spatial subjectivities. Equally, it was impossible to disentangle digital spatial logic from other processes of spatial transformation. The availability of free, fast internet connection has enabled changes in working practices in Hackney: for example, the development of entrepreneurs working from coffee shops. However, these digital practices are embroiled in a wider set of non-digital social, political, and economic changes to the physical space of areas such as Broadway Market.

This thesis argues that thinking the concepts of the virtual and actual in spatial terms is a useful tool for thinking the complexity of spatial production and the role of the digital within it. Space is viewed as having two faces, the virtual and actual. The actual is physical, observable and navigable. The virtual is an opaque force formed from a multiplicity of antagonisms, desires, personal and collective spatial narratives and affective experience. Human and more-than-human processes entangle virtual and actual space in a process of continuous becoming. Virtual space attempts to grasp the complexity of personal and social processes of spatialisation that forms the context within which ubicomp and mobile computing intervene. Rethinking virtual space requires a breaking down of the binary between the digital and the physical and accepting that the world of physical space and the digitally mediated world do not exist as somehow two separate layers. Mobile storytelling enters into dialogue with non-digital spatial narratives. Digital representations intersect with non-digital representations. The concept of virtual space opens up the possibility of ubicomp and mobile computing research that focuses on developing an understanding of the processes that produce spatial subjectivities. This chapter has shown that the practices of psychogeography offer many opportunities to observe and reflect on these processes.

Whilst the concept of virtual space refuses the digital/physical binary in understanding spatial subjectivities, the digital does add new dimensions to the process through which city space is produced and reproduced. The Hackney Drift did not make the digital central to the study, and while it exposed important processes of spatialisation it also suggested that digital technologies disappear into the background of perception and the need to expand and adapt the technique of the drift to engage with these. Two important processes identified for further investigation were the invisible nature of digital infrastructures and the role of digital representations of space. The following chapter will present the results of two studies which expand the practice of psychogeography in an attempt to render the city's digital infrastructure knowable.

5 Actual Space

5.1 Practice Insert 2 – ‘Invisible Geographies’

Giant Invisible Pulsating Electromagnetic Sphere Hovering Above My Orange Settee

The emergence of the digital city can be traced back to the end of 2003 and the beginning of 2004. WIFI was just starting to have an impact on peoples' everyday life. The 802.11g standard had been launched giving WIFI faster speeds and enabling coverage over much greater distances. This was greeted with a utopian political movement, led by activist groups such as YouAreHere [1] in London and free2air in Berlin. Their aim was to build and mesh local area wireless networks to provide communities with Open Distributed Public Wireless (ODPW). YouAreHere set itself the goal of developing a wireless backbone reaching from Limehouse to Hackney Central. They constructed a series of masts at strategic sites along the route. One of the most significant masts was mounted on the top of Limehouse Town Hall, which also housed the headquarters of the London Psychogeographical Association (LPA) [2].

At the same time, third generation (3G) wireless mobile telecommunications technology was rapidly being introduced to providing faster internet speeds for mobile devices. In contrast to the optimism of the ODPW activists, the introduction of 3G was met with anxiety, paranoia and fear. The roll-out of 3G technology involved the siting of a network of mobile phone masts throughout the country. In East London, the rooftops of high rise buildings on working class estates were chosen to locate the majority of these masts. Around the country, residents had begun tearing down mobile-phone masts, as public concerns over the untested health impact of the radiation they emit hit national headlines. The Telegraph reported [3] that in one week as many as four masts were destroyed in a campaign to stop them being placed on top of, or close to, peoples' houses. Working class people accused the mobile phone companies of using them as guinea pigs. In Hackney, a group of Kurdish activists chained themselves to a mast while it was still on the lorry delivering it to be installed on the roof of their block. In London Fields, one 90 year old resident of the Wayman Court estate refused to move from a site adjacent to his flat that had been given planning permission for a mast.

In this febrile atmosphere of utopianism and paranoia, it was clear that the construction of wireless and mobile networks signalled a significant transformation of the landscape. I purchased an A-Com receiver used by telecoms engineers and started to listen to the new world of data transmissions. The crackle of white noise greeted me as I switched it on. I noticed a distant pulsing signal that drew me towards it. I was in the front room of my flat and its intensity increased as I started to approach my settee. The sound throbbed with metallic bass tones. I moved my receiver towards the settee then back again. The signal was surprisingly spatial. I carefully traced its shape revealing an invisible pulsating electromagnetic sphere hovering above my orange settee. From that moment, I saw the city as overlaid with invisible lines, shapes and structures, a coded geometry of machine to

machine interactions beyond our perception.

As the UK prepares to introduce 5G cellular network technology, I am struck by an overwhelming sense of Déjà vu. Time seems to be punctured by accelerating epochs of pseudo progress X to the power G. 5G transmissions are broadcast on frequencies between 3.4 — 3.6GHz. These waves travel shorter distances through urban spaces, so 5G networks require more transmitter masts than previous technologies, positioned closer to ground level. The construction of the 5G network has sparked viral conspiracies, renewed health fears and an angle grinder attack by residents of one working class estate in Manchester. The next generation of utopian media artists are already presenting critical 5G projects at media arts festivals.

CODED GEOMETRY is scanning the 3.4 to 3.6GHz spectrum using new antenna designs connected to Software Defined Radio (SDR). We are conducting research analysing and mapping the structures, invisible geographies and ambience this technology is bringing into being. Researching the spatial aesthetics new circuits of digitality are bringing forth. Asking how they will shape our understand and experience of space and spatiality.

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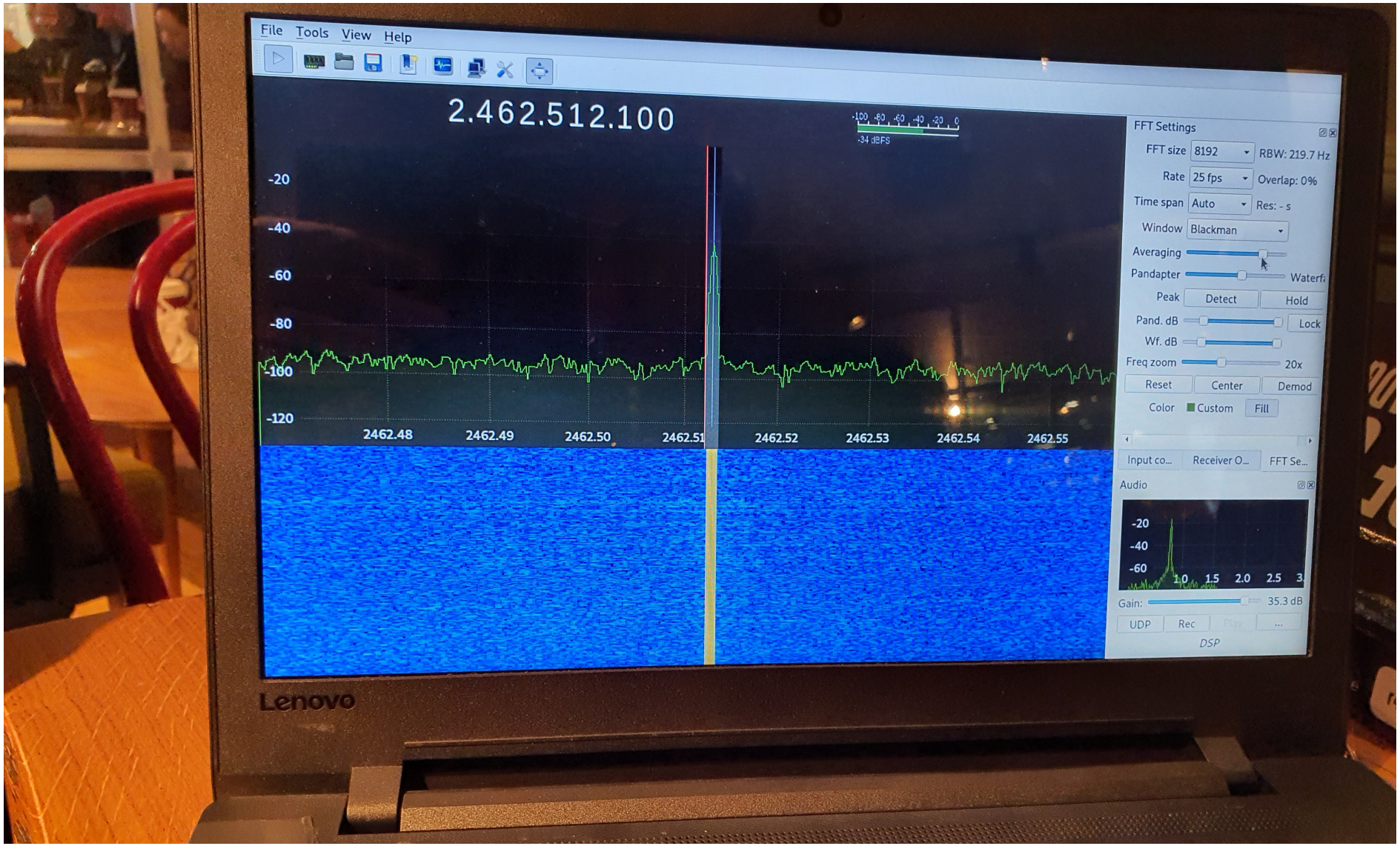
[1] For more information about YouAreHere see — http://www.metamute.org/editorial/articles/network-people

[2] The LPA was originally suggested by the British artist Ralph Rumney in 1957 and reinvoked, in the early 1990s as the LPA East London Section. For more information see — https://maydayrooms.org/archives/the-london-psycho-geographical-association/

[3] See Daniel Foggo, 30 Nov 2003, Protesters topple mobile phone masts as health scare spreads, The Telegraph. see — https://www.telegraph.co.uk/news/uknews/1448109/Protesters-topple-mobile-phone-masts-as-health-scare-spreads.html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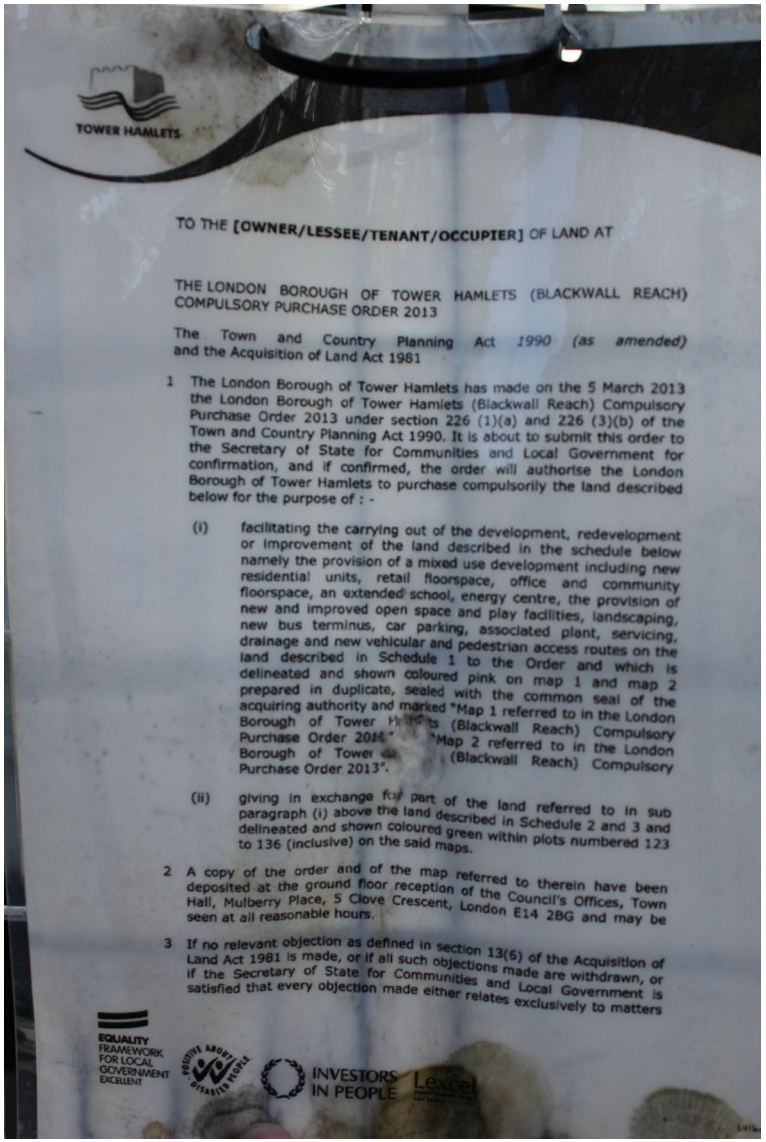
<<< Invisible Geographies >>>

Limehouse sailors mission to the Robin Hood Gardens
Saturday 15th April 2015


HSBC

ROBIN HOOD GARDENS — ANTI-GENTRIFICATION GHOST DANCE

Listen at: https://tinyurl.com/yyqrue2y



TOWER HAMLETS

TO THE **[OWNER/LESSEE/TENANT/OCCUPIER]** OF LAND AT

THE LONDON BOROUGH OF TOWER HAMLETS (BLACKWALL REACH) COMPULSORY PURCHASE ORDER 2013

The Town and Country Planning Act *1990 (as amended)* and the Acquisition of Land Act 1981

1 The London Borough of Tower Hamlets has made on the 5 March 2013 the London Borough of Tower Hamlets (Blackwall Reach) Compulsory Purchase Order 2013 under section 226 (1)(a) and 226 (3)(b) of the Town and Country Planning Act 1990. It is about to submit this order to the Secretary of State for Communities and Local Government for confirmation, and if confirmed, the order will authorise the London Borough of Tower Hamlets to purchase compulsorily the land described below for the purpose of : -

(i) facilitating the carrying out of the development, redevelopment or improvement of the land described in the schedule below namely the provision of a mixed use development including new residential units, retail floorspace, office and community floorspace, an extended school, energy centre, the provision of new and improved open space and play facilities, landscaping, new bus terminus, car parking, associated plant, servicing, drainage and new vehicular and pedestrian access routes on the land described in Schedule 1 to the Order and which is delineated and shown coloured pink on map 1 and map 2 prepared in duplicate, sealed with the common seal of the acquiring authority and marked "Map 1 referred to in the London Borough of Tower Hamlets (Blackwall Reach) Compulsory Purchase Order 2013" "Map 2 referred to in the London Borough of Tower (Blackwall Reach) Compulsory Purchase Order 2013".

(ii) giving in exchange for part of the land referred to in sub paragraph (i) above the land described in Schedule 2 and 3 and delineated and shown coloured green within plots numbered 123 to 136 (inclusive) on the said maps.

2 A copy of the order and of the map referred to therein have been deposited at the ground floor reception of the Council's Offices, Town Hall, Mulberry Place, 5 Clove Crescent, London E14 2BG and may be seen at all reasonable hours.

3 If no relevant objection as defined in section 13(6) of the Acquisition of Land Act 1981 is made, or if all such objections made are withdrawn, or if the Secretary of State for Communities and Local Government is satisfied that every objection made either relates exclusively to matters

EQUALITY FRAMEWORK FOR LOCAL GOVERNMENT EXCELLENT

INVESTORS IN PEOPLE

5.2 Analysis

This chapter answers the research question: *What can a psychogeographical art practice reveal about the role infrastructure plays in the production of the digital expanded space of East London?*

It answers the research question by using techniques that focus the participants' attention on the materiality of the usually hidden infrastructure of ubiquitous and mobile computing. Two separate drifts were organised. The first, 'Invisible Geographies', made use of specially designed radio receivers (See Methods chapter) to make the transmission of communications infrastructure such as wi-fi, Bluetooth, and mobile phones, audible. The second drift, 'Searching for the Cloud', tracked down the sites of East London's data centres, linking them through a drift that revealed the physicality of the infrastructure that supports cloud computing.

I argue within this chapter that the invisibility of infrastructure, rather than being a by-product of the nature of digital technology, is in fact a fundamental driver in the development of ubiquitous and mobile computing. It is firmly rooted in the philosophy underpinning the development of ubiquitous and mobile computing, and this carries ethical and political consequences that need to be addressed within both HCI and spatial research. I suggest that fine art performance practices that explore the aesthetic and poetic qualities of urban space can play a valuable role in thinking about this problematic.

Infrastructures can be defined as built networks that facilitate the flow of goods, people, or ideas and allow for their exchange over space (Larkin, 2013). The aim of making digital infrastructures knowable emerged as a direct response to the perceived failure of the Hackney Drift (See Chapter 4 – Virtual Space) to locate the digitally expanded city. Within my thesis I use the term 'knowable' as an alternative to 'visible' to emphasise a shift away from the dominance of sight and the recognition of other embodied ways of understanding the world – for example, sound, touch, smell, taste – but also less clearly defined experiences such as intuition, anxiety or the thinking which accompanies perception. I concluded the Hackney Drift report (See Chapter 4 – Performance Insert) with the following note: '*The digital city that I was searching for and had failed to locate is,*[...]*, in part invisible. It is not accessible through the normal human senses, only disclosing its presence through its absence. Those moments of low signal or lack of wifi connection*'. This intuitive response is mirrored by ubicomp's desire to make technology 'disappear', for it to become 'invisible', or 'fade into the

background' (Heer and Khooshabeh, 2004). It also echoes the sentiment expressed by many infrastructure studies that most people are socialised to know very little about the infrastructures that surround them in everyday life, whether these are electrical systems, sewer pipes or broadcast networks. Not only are people socialised to be unaware of such systems; infrastructures are often designed intentionally to be invisible or transparent, integrated with the built environment, whether submerged underground, covered by ceilings and walls, or camouflaged as 'nature' (Parks, 2012). Many infrastructural studies have suggested that infrastructures remain invisible, only revealing themselves when they are disrupted or when they break down (See Star, 1999; Collier, 2011, Elyachar, 2010, Larkin, 2008, Farman, 2015; Graham, 2011 p. 92; Graham, 2010; Graham & Marvin, 2002, p. 3). Larkin (2013) has challenged the characterisation of infrastructure as invisible. He suggests that there is a range of infrastructural visibilities, from the unseen to the grand spectacle and everything in between (Larkin, 2013). For example, we can compare the invisibility of the London sewer system with the spectacle of Tower Bridge. The invisibility/visibility of infrastructure is often a political choice. For example, at the time of writing the government was widely promoting the Northern Powerhouse Rail (NPR) project, 'a major strategic rail programme, designed to transform connectivity between the key economic centres of the North'.[14] The NPR's high visibility in the media owes more to its symbolic political value than its infrastructural potential. Invisibility is not a natural aspect of infrastructure. It is therefore important to distinguish the specific condition of invisibility of any given infrastructure. The focus of my research is the invisibility of East London's digital infrastructure. More precisely, the infrastructure of the internet that enables ubiquitous and mobile computing.

The Hackney Drift had suggested that East London's digital infrastructures are rendered either psychologically or practically invisible. The digital technologies that underpin and enable ubiquitous and mobile computing have had a profound impact on every aspect of our daily lives: how we communicate, socialise, shop and navigate the city. They can be shown to have had a dramatic impact on the physical space of the city. One example is the impact of internet shopping on the nature of town centres. Yet as we walked the streets of Hackney, this profound transformation hardly featured at all. The participants responded to cultural and political concerns about gentrification, but the impact of digital technologies, perhaps the most profound social, cultural, and political transformations of the past few decades did not feature. The Hackney Drift itself had been organised using the internet and social media. The participants had been brought together for the drift through digital technology. Mobile phones

[14] Northern Powerhouse Rail (NPR). [online] Available at: https://transportforthenorth.com/northern-powerhouse-rail/ [ACCESSED 26. Aug 2019]

were used while participating in the drift, both to document the event, but also as an active element. Phones were used to research various sites – for example, to research the garland crest above the old Hackney Library, now the Hackney Picturehouse. While mobile computing played an active role in the drift, somehow its presence and impact were not registered as significant. Ubiquitous and mobile computing is perceived as being ephemeral, and this perception distances people from an understanding of how these technologies impact upon urban space.

This chapter looks at the potential of extending psychogeographic practices to focus participants' attention on the usually invisible materiality of East London's digital infrastructures. Psychogeography does not approach digital infrastructure from a technical perspective. Psychogeography is interested in the everyday ambience created by infrastructures and intervenes in the city to expose overlooked or previously inaccessible processes, bringing them into discourse. It is interested in serendipitous encounters and the value of the aesthetic and sensorial experience and the desires and dreams inspired by digital infrastructure. It is by focusing on the ontic, the aesthetic and the poetic qualities of digital infrastructures that psychogeography presents a unique approach to understanding the role they play within the digitally expanded city.

In Chapter 4, I argued for a conceptualisation of city space as the interplay between the virtual and the actual brought together by social practices. When applied to the digitally expanded city, this raises important questions. If the materiality, the actual space, of digital infrastructure is rendered invisible, are the virtual and actual aspects of the digital city severed? These questions raised by digital infrastructure's retreat into invisibility draws us back to the core research question: *What can a psychogeographical art practice reveal about the role infrastructure plays in the production of the digital expanded space of East London?*

The analysis focuses on the findings of two drifts: 1) Invisible Geographies, and 2) Searching for the Cloud. The two drifts depart from the historic practices of psychogeography. My own performance art practice borrows from, builds upon and expands psychogeographical techniques to orient them towards the intersection of digital technology and urban space. The drifts used two different techniques to disrupt the usually invisible experience of East London's digital infrastructure, bringing its materiality to the attention of the participants. Invisible Geographies used techniques that made wireless digital communications audible, exposing the underlying audio texture of data transmissions. Searching for the Cloud engineered an encounter between the participants and the key data centres that enable

London's internet communications. It took the form of a walk linking seven of the key data centres that form the London Internet Exchange (LINX).

Analysing the experience of these two drifts, four key themes emerged which will be addressed in depth throughout this chapter. They were: 1) infrastructural invisibility; 2) the affect of infrastructure; 3) the infrastructure of fantasy, desire and imagination; 4) infrastructure as labour. The first three of these themes emerged from both drifts, despite their very different approaches to digital infrastructure. This raised questions about how this analysis should be structured. Should it be structured by theme, drawing simultaneously from both drifts, or should the drifts be analysed separately, drawing out and cross-referencing these emergent themes? The first approach would potentially rip the findings from their context, while the second would risk repetition. I have chosen to risk repetition in an attempt to situate the knowledge (Haraway, 1988) that emerged from the drift within a narrative structure that maintains spatial context.

This chapter is divided into two key sections, that will be brought together in the Conclusion. The first section outlines the findings of Drift 3 – Invisible Geographies. The second part of this chapter looks at the findings of Drift 4 - Searching for the Cloud.

5.2.1 Drift 2 – Invisible Geographies.

Invisible Geographies expanded the practice of psychogeography by introducing broad spectrum radio frequency (RF) receivers to the drifts. The radio transmissions from digital equipment such as mobile phones, wi-fi and Bluetooth were made audible throughout the walk by connecting the RF receivers to portable audio amplifiers. It was an active choice to use portable amplifiers with attached speakers, rather than headphones which would have isolated the walkers from each other. This enabled findings to be shared and discussions to take place freely amongst the participants. The broad-spectrum RF antennas are sensitive to a wide array of electromagnetic fields produced by devices such as laptops, and also mains electricity and overhead pylons, exposing not only digital radio frequencies but also the supporting electrical infrastructure.[15] Use of the antennae within the drift make wireless infrastructures audible, allowing the participants to become aware of their presence as they walk the environment.

[15] See the work of Christina Kubisch for a general exploration of environmental electromagnetism.

My analysis focuses on the findings of two separate Invisible Geographies drifts. The first was carried out on Saturday 15 April 2015. Five people participated in the drift. It started outside Limehouse Town Hall, opposite the Limehouse Sailors' Mission. and walked to the Robin Hood Gardens estate where communications signals were explored and recorded. The second drift took place on April 12 2019 as a performance presentation at 'Approaching Estate: methodologies for practices of site and place', held at the Furtherfield Commons gallery space in Finsbury Park. The event was organised by the Sensingsite research group based at Central St. Martins. There are some important differences in how the two events were organised, which had some impact on the participants' experience. The Robin Hood Gardens drift was organised under the auspices of CODED GEOMETRY, a social media front organisation I used to organise psychogeographical events. CODED GEOMETRY, through its rhetoric and presentation, was itself a feral performance that mimicked the style and methods of historic avant-garde groups. CODED GEOMETRY attracted people who already had an interest in London's psychogeographical subculture. At the time of the drift, Robin Hood Gardens was a politically contested site, as it was being cleared for demolition.

Figure 7- Invisible Geographies participants listening to radio frequencies

In contrast, the Finsbury Park drift was organised as part of a formal research event by the Sensingsite research group based at Central St. Martins and supported by Furtherfield Commons gallery. The participants in this drift were predominantly artists, researchers and academics with a specific interest in site-based fine art and performance practices. Some notable differences were observed in the responses of the participants to the drifts. The Finsbury Park participants tended to be more analytical in their response. The Robin Hood Gardens participants responded through a more directly political lens. However, a number of overarching similarities were observed between both drifts, and I will analyse them in more depth below.

Infrastructural Invisibility

Figure 8 - Invisible Geographies participants listening to radio frequencies

I will start the analysis of the Invisible Geographies drift at one particular location, standing on an area of scrubland in Finsbury park. The location was just off the Capital Ring path as it enters Finsbury Park from Stroud Green Road. Three drift participants had stopped near a recently planted tree down a small slope from the path. Two of the participants were holding their antennae and discussing with the third an interesting discovery. A repetitive sequence of sounds was being received at this location. Its alien sound had a coherent structure of rising and falling frequencies. The participants with antennae stood frozen to the spot, raising and lowering their antennae and changing their direction. One suggested that the transmission was stronger at head height and became weaker above this level or close to the ground. A clearer signal could be received by holding the antenna in a particular direction. The participants looked around, speculating on the source of the transmission. On the brow of a small hill three men sat together with their backs to the drift, drinking strong alcohol, rucksacks leaning up behind them. To the left a small building behind a tall green metal fence, possibly a community centre, had its doors open and local youth were entering and leaving. The participants speculated. Was the transmission they were listening to wi-fi data from the community centre or mobile data from the three drinkers? The participants could not locate the source of the transmission, but what was clear was that they had tapped into a stream of data. The data was surprisingly spatial in that the participants experimented in tracing its boundaries. The signal would weaken and recede into the static of background white noise if the antenna was moved too far to the left or right, or equally too high or too low. The combination of movement and audio feedback gave the participants an embodied experience

of the intangible phenomena of wireless data transmission. The participants remained in this location for nearly ten minutes, testing out parameters, walking the data transmission. In their conversation, the participants discussed the infrastructure of digital communications, fascinated by the idea they had passed through a field of data. Had they walked through someone's email? A web page of images being downloaded ? A stream of music received and recompiled by someone's Spotify app? A telephone conversation, or the highly personal communication between lovers? Whilst the experience could not be understood by the participants in technical terms the experience had given them an embodied understanding of the infrastructure of ubiquitous and mobile computing.

The purpose of this sub-section is to analyse what a psychogeographically-inspired art practice can reveal about infrastructural invisibility and to highlight the critical and philosophical implications of these findings for future spatial research. As I have pointed out in the introduction to this chapter, digital technologies are perceived to be ephemeral. Their existence in physical space is rendered psychologically invisible. What held the three members of the Invisible Geography drift captivated on a seemingly unnoteworthy piece of scrub grass was an experience of digital technology that they hadn't experienced before. They had gained access to a steam of data communications that was passing through their own bodies at this location. Its spatial properties surprised both them and me. It was so clearly local and spatially defined. The response of the participants was to discuss the experience, to try and make sense of it, to construct a virtual understanding of the actuality of the data transmission. In this respect I would argue that the Invisible Geographies drift was successful in rendering the ephemeral nature of digital communications knowable. Not only had they become aware of the data signal cutting across the park at this location, they had also gained access to an embodied understanding of the signal's materiality. Its particular transmission rate and its sonic frequencies entered their knowledge. They had used their bodily movements to trace its spatial qualities, its location in the park, its height and width. This helped them to imagine the park criss-crossed with a multiplicity of data transmissions. Providing the participants with the ability to experience the infrastructure from a new perspective, they discovered for the first time the sound, rhythms and spatial quality of a stream of data, an understanding that they had not previously experienced. It also prompted a more profound cultural and political question. How and why is digital technology rendered invisible within East London, and what ethical consequences does this carry?

In an attempt to answer this question and gain a deeper understanding of the specific quality of the invisibility of digital infrastructure in East London, I will dig vertically into the conceptual and philosophical roots of ubiquitous and mobile computing. Understanding the

nature of infrastructural work involves unfolding the political, ethical, and social choices that have been made throughout its development (Bowker et al., 2010). Perhaps the most obvious place to start is with the conceptual ideas of Mark Weiser, who is credited with coining the phrase 'ubiquitous computing' during his tenure as Chief Technologist of the Xerox Palo Alto Research Centre (PARC).

The desire for infrastructures to become invisible has been a central driving force in the historic development of ubiquitous and mobile computing. Mark Weiser's foundational talk on ubicomp, at the 7th annual ACM symposium on User Interface Software and Technology in 1994, was entitled 'Creating the invisible interface', and linked the concept of the invisible directly to his vision of an emergent ubiquitous computing. Weiser stated:

> For thirty years, most interface design, and most computer design, has been headed down the path of the "dramatic" machine. Its highest ideal is to make a computer so exciting, so wonderful so interesting, that we never want to be without it. A less-travelled path I call the "invisible"; its highest ideal is to make a computer so imbedded, so fitting, so natural, that we use it without even thinking about it. (I have also called this notion "Ubiquitous Computing") (Weiser, 1994, p. 1).

In the years since Weiser set out his vision for the development of ubiquitous computing, his concept of' the invisible' has remained something that is both desirable within the wider HCI community and central to the mobile and ubicomp project. For example, Norman (1998) argued that the invisible computer is the natural goal of PC development. Fishkin et al. (1998) placed 'invisible user interfaces' as the central goal of their work. Two of the foundational texts of HCI, Suchman (1987) and Dourish (2001), highlighted the importance of the invisible, linking it to their reading of phenomenology, which I will explore further below.

In their illuminating overview of the of the notion of the invisible as it is used within the ubiquitous computing community, Heer and Khooshabeh (2004) divide HCI's concept of the invisible into two interlinked approaches:

1) Invisibility-in-use
2) Infrastructural invisibility

Invisibility-in-use describes the psychology of tool use. In this conception the invisible is understood as hidden from conscious attention. Invisibility-in-use focus on the way people make use of tools without continuously monitoring them. For example, when I draw with a

pencil, I do not think about the pencil, I concentrate on the drawing. The pencil becomes 'invisible' to my consciousness; however, if the pencil lead should break, I can no longer draw and my focus becomes the pencil itself. At this point the pencil is rendered visible and becomes the focus of my attention. Dourish (1999) makes the same point using the example of a computer mouse.

> Much of the time, I act through the mouse; the mouse is an extension of my hand as I select objects, operate menus and so forth. […] Sometimes, however, for instance on those occasions when I reach the edge of the mousepad and cannot move the mouse further, my orientation towards the mouse changes; now, I become conscious of the mouse mediating my action, and the mouse becomes the object of my attention as I pick it up and move it back to the centre of the mousepad (Dourish, 1999).

At the core of invisibility-in-use is the phenomenology of perception. When the tool works as expected, the tool itself recedes from conscious attention. It becomes invisible in use.

The second notion of the invisible in HCI is infrastructural invisibility. Infrastructural invisibility describes the capacity for infrastructure, whether physical, technological, or organisational, to become tacit in thought and action for human users (Heer and Khooshabeh, 2004). The implementation of ubiquitous and mobile computing is predicated on a vast infrastructure of electromagnetic waves beaming down from mobile phone towers and GPS satellites; from wi-fi routers and Bluetooth devices connected to a tangle of twisted pairs of copper wires and fibre-optic cables, interconnected in the joining rooms of data centres, with the ability to connect our devices to what Brian Holmes poetically describes as an 'intangible planetary skin' (Holmes, 2009). The aim of infrastructural invisibility is to hide the infrastructural complexity required by our digital interactions, allowing users to concentrate on the task in hand. For example, if I send an email from my mobile phone, the device has to negotiate a series of complex infrastructural procedures. While writing the email, I do not have to think in terms of electrons, logic gates, or machine instructions. These machine-level operations are rendered invisible by the interface that acts as a mediator between the user and the technical infrastructure. When the email is sent, the mobile phone has to interface with a wider communications infrastructure. Procedures will make the decision about whether to use wi-fi or a mobile data network. The human-readable email will be broken down into a series of packets. Radio frequency standards will be followed to broadcast the packets, which will then be routed through a series of servers, reassembled at the desired destination and converted back into human-readable text for the intended recipient. From the sender and recipient's perspective they have simply sent and received an email. They have had no

knowledge of the complex infrastructural procedures that have enabled their interaction. This infrastructure has been rendered invisible. HCI researcher Sturla Bakke (2010) identified a trend in HCI such that the cultivation of an information infrastructure would benefit from hiding the infrastructural complexity beneath an easily comprehensible user-interface both to make an interface easy to learn for new users and to offer quicker ways for experienced users to complete their tasks. In science and technology studies (STS) this is referred to as 'blackboxing' (Latour, 1999, p.304; Latour, 1987, pp.2-3). Blackboxing is 'the way scientific and technical work is made invisible by its own success. When a machine runs efficiently, when a matter of fact is settled, one need focus only on its inputs and outputs and not on its internal complexity. Thus, paradoxically, the more science and technology succeed, the more opaque and obscure they become' (Latour, 1999, p.. 304).

Many researchers interested in developing ubiquitous computing are in the process of taking infrastructural invisibility even further, reducing the need for any user interface by embedding computing directly into the environment. Examples include the construction of the Internet of Things (IoT) or the development of smart cities. This vision of 'everyware' computing (Greenfield, 2010) aims to realise Weiser's (1991) desire for a ubiquitous computing which recedes into the background, ultimately becoming an ambient part of the environment. Such a concept of invisible everyware computing has profound implications for the understanding of urban space and how it is being digitally expanded. As Weiser remarks, 'Such a disappearance is a fundamental consequence not of technology, but of human psychology. Whenever people learn something sufficiently well, they cease to be aware of it. When you look at a street sign, for example, you absorb its information without consciously performing the act of reading' (Weiser, 1993). The mobile phone masts which were the cause of concern and protest in 2003[16] are now ubiquitous growths atop most tall buildings; however, they are no longer part of public consciousness. They have become just as invisible as the data transmission experienced by the participants in the Finsbury Park drift.

Weiser provides a list of writers who have influenced his concept of the invisible. Perhaps the most significant of these is a philosopher who has influenced much thinking about invisible within HCI theory, Martin Heidegger. Heidegger's theory of the 'ready-to-hand' is not only at the core of Weiser's theory of ubiquitous computing, it at the core of both Suchman's and Dourish's early writing on HCI.[17]

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16 Foggo, D. 2003. 'Protesters topple mobile phone masts as health scare spreads'. *Daily Telegraph*, 30 Nov. Available at: https://www.telegraph.co.uk/news/uknews/1448109/Protesters-topple-mobile-phone-masts-as-health-scare-spreads.html [Accessed 2/4/2019]

17 For more information about the influence of Heidegger on the early ideas of HCI see :
Suchman, L.A., 1987. *Plans and situated actions: the problem of human-machine communication*. Cambridge: Cambridge University Press.

Suchman, back in 1987, argued that although we can construct rational accounts of our actions before or after an event, when an action proceeds without interruption or problems the action becomes transparent to us. This is the case with invisible infrastructure. While our technologies carry out the actions we require, the actual functioning of the action remains transparent. Suchman (1987) explains that, in Heidegger's terms, 'equipment that is "ready-to-hand" […] has a tendency to "disappear"'. To explain this process he uses the example of a blind man:

> Consider the example (used by Wittgenstein and Merleau-Ponty) of the blind man's cane. We can hand the man the cane and ask him to tell us what properties it has. After hefting and feeling it, he can tell us that it is light, smooth, about three feet long, and so on; it is present-at-hand for him. But when the man starts to use the cane (when he grasps it in that special mode of understanding that Heidegger calls "manipulation") he loses his awareness of the cane itself; he is aware only of the curb (or whatever object the cane touches); or, if all is going well, he is not even aware of that. Thus it is that equipment that is ready-to-hand is invisible just when it is most genuinely appropriated' (Suchman quoting Dreyfus [pre-publication], 1991, p.65).

As with Dourish's earlier example of the mouse, the cane itself becomes invisible when it is ready-to-hand; however, should the cane be broken, the blind man's orientation in relation to the cane changes. He becomes conscious of the cane itself. Heidegger describe this new orientation as the cane being present-at-hand. The implementation of the invisible within ubiquitous and mobile computing masks the complexity of the technology itself. It has facilitated the non-specialist use of computing and the employment of mobile and ubiquitous computing into urban space. For example, it has enabled the use of navigation applications by users with no knowledge of the complex workings of the Global Positioning System (GPS), the satellite-based positioning and navigation system owned and operated by the US Department of Defense. Invisibility, however, is not a benign quality. While it can enable the use of complex and specialist technologies by non-specialist users, it also has the possibility of rendering power and control invisible. We have seen over the past decade, through the work of whistle-blowers and researchers, the use of digital technology for the mass harvesting of personal data by the NSA or interference in democratic elections by private organisations such as Cambridge Analytica. Invisibility enables the use of digital technologies but also has the potential to mask the misuse of personal data. As HCI research invests further in the

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Winograd, T., Flores, F. and Flores, F.F., 1986. Understanding computers and cognition: A new foundation for design. Intellect Books.
Dourish, P. 2004. *Where the action is: the foundations of embodied interaction*. Cambridge, MA: MIT Press.

psychology of the invisible it is essential that it also considers the ethics of invisibility. This situation is likely to become increasingly relevant as ubiquitous computing becomes a reality and more environments and objects are embedded with computational capacities: for example, the use of environmental sensors in the South Korean smart city Songdo.

Heidegger's theory of equipment manifests itself in the production of the space of East London through the invisibility of digital tools and infrastructure. The Hackney Drift exposed that the participants' awareness of digital technology receded, even when mobile phones were explicitly used. The Invisible Geographies drift, in contrast, addressed the digital deficit by making digital infrastructures central to the consciousness of the walkers. By making the wireless communications audible and explorable through movement, they were rendered phenomenologically knowable by the participants. Such a shift in orientation allowed the participants to visualise the digital within the city and by doing so brought the invisibility of digital technology into discussion.

One of the goals of psychogeography is to disrupt the everyday experience of the city, an act of estrangement that intends to move the participants beyond the everyday understanding of the city, making the familiar unfamiliar and in doing so exposing the practices involved in constructing and reconstructing their understanding of space. In his research on artists working within the realm of locative media, Pinder (2013) terms the process of disrupting spatial imaginaries 'dis-locative'. He argues that

> […] one continued significance of locative art is its potential ability to interrupt and to make strange ways of seeing and locating that are becoming increasingly normalized and taken-for-granted, so as to render them perceptible and open to question. It is with that in mind that I propose the term dis-locative, which refers not to a category of practice but rather to performative effects. Specifically it is concerned with questioning, unfixing and unsettling location and ways of locating, where these effects are understood as potential means of challenging social–spatial imaginaries and of opening space for other ways of seeing, understanding and orienting (Pinder, 2013).

I would argue that extending the psychogeographic drift through the use of RF antennae was successful in exposing elements of ubiquitous and mobile computing's invisible infrastructure. By exposing aspects of the material infrastructure of digital technology in the city, these practices enabled participants to start to construct a virtual understanding of this technology. The Finsbury Park drift opened up a very focused political conversation about the

ethics of invisibility which I have expanded upon through engagement with theories of the invisible commons within HCI, ubicomp and mobile research.

I now want to turn to some of the less obvious responses to the Invisible Geographies drift. These I would describe as responses that constructed a unique spatial imaginary of sites from the aesthetic qualities of the audio produced by the RF antennae and the physical experience of being situated within a particular location. Numerous instances were observed, and I will give two separate examples. The first is from the Finsbury Park drift and the second is from the Robin Hood Gardens drift.

Whilst walking in Finsbury Park listening to the noise created by electromagnetism, one participant stopped. With a lack of self-consciousness, he could be observed making almost trance-like small repetitive movements. He was holding the ping-pong bat-shaped antenna in his right hand and the cube amplifier it was attached to in his left. He would raise the antenna and slowly swing the amplifier from his side to his front then back again, altering the direction of the antenna by 45 degrees, then repeat the movement. He would then take a few steps forward and repeat the actions. There was an almost spiritual quality to the precision and concentration involved in these repetitive movements. I approached and asked him what he had been listening to. He described to me how he had discovered distinct bands of noise that ran parallel to a steep banking covered with trees. These bands were defined by clear directional changes in the texture of the sound. By turning the antenna 45 degrees, he would tune the sound in or out exposing a clear direction to the signal. At first he had suspected that he was picking up feedback from the amplifier but had disproved this thesis by altering the position of the amplifier in relation to the antenna. Having disproved this suspicion, he was convinced that he could define different textured fields running roughly parallel to the bank. The bank and trees that ran along it masked a train line with high-voltage overhead electricity cables suspended above the tracks. While this could be a potential explanation for the bands of textured noise he was observing, what was more interesting to me was the way he was constructing a detailed and embodied understanding of this space, one that he was starting to explain in terms of an electromagnetic field with its own spatial properties that he was carefully mapping through his movements. He was constructing his own mental map of the park, overlaid with invisible channels and groves. He explained the boundary between two bands: '*If you come here, listen, but if you move, you can hear the difference*'. He was using specific spatial markings to explain the positions of the borders between the electromagnetic field he had mapped.

The next example occurred while participating in the Robin Hood Gardens Invisible Geographies drift. The drift had made its way from Limehouse Town Hall to Robin Hood Gardens. Robin Hood Gardens is a housing estate in Poplar, London, designed in the late 1960s by architects Alison and Peter Smithson. At the time of the drift, residents had been given compulsory purchase orders as part of a plan to demolish and regenerate the estate's Brutalist architecture. (The western block was eventually demolished in December 2017.) The estate consisted of two long, curved ten-storey blocks facing each other across a green space that featured a central hill. One participant was walking with a friend, on the grass of the central garden, parallel to the eastern block. As they walked, listening to the environment using the RF antennae, they entered a transmission emanating from the block. This was a pulsing rhythm that contained a lot of bass frequencies. While these sounds were unfamiliar they had something of the sonic quality of techno dance music. The participants called other members of the drift over to experience the sounds. Prior to stumbling across this strange sonic texture, the participants had been discussing the compulsory purchase order notifications we saw attached to the fence as we entered the estate. One participant suggested that for them these sounds represented the perfect soundtrack for the Brutalist nature of the building. Another suggested it reminded them of angry rebellious music and they could imagine the residents rioting to defend the estate from demolition to this soundtrack. They described the transmissions as having a filmic quality that totally fitted its location.

In both these two examples, the aesthetic qualities of sounds produced by listening to digital infrastructures were interpreted in relation to the physical location in which they were experienced. Larkin (2013) suggests that aesthesis refers not to the mental appreciation of works of art, but to a bodily reaction to lived reality: 'It is a form of cognition, achieved through taste, touch, hearing, seeing, smell,' […] Aesthetics in this sense is not a representation but an embodied experience governed by the ways infrastructures produce the ambient conditions of everyday life: our sense of temperature, speed, fluorescence, and the ideas we have associated with these conditions. Infrastructures create a sensing of modernity (Mrázek, 2002), a process by which the body, as much as the mind, apprehends what it is to be modern, mutable, and progressive' (Larkin, 2013). The experience of the drifts drew from the aesthetic qualities of the infrastructure, merging these qualities with the aesthetics of the environment itself. Infrastructure was revealed to have local qualities and aesthetics far beyond its technical function as part of a larger integrated system. For example, these transmissions have consistent spatial qualities, the boundaries of which can be traced. They have specific audio qualities. The pitch of a 4G mobile phone mast is very different from that of a wi-fi router. All these aesthetic qualities are situated within the environment. For those

experiencing the drift this enabled a fully embodied and situated experience of digital infrastructure's transmissions to emerge.

Larkin (2013) has argued for infrastructures to be studied in terms of their politics and poetics. He argues that what distinguishes the poetic is when a speech act is organised according to the material qualities of the signifier itself rather than to its referential meaning. Therefore, in the case of infrastructures, the poetic mode means that form is loosened from technical function. The infrastructure's poetic imaginary is decoupled from its technical function. Larkin describes how the poetics of grand infrastructure projects have been used as a political signifier. The poetics of ubiquitous and mobile computing tend to mirror the metaphors of the invisible or the ephemeral: for example, cloud computing. It has become commonplace for people to describe their photos as being stored in the cloud. In this respect, expanding psychogeography's techniques to make invisible infrastructures audible has been shown to promote a new poetics of space and a greater understanding of the unique aesthetic qualities of the infrastructure that enables ubiquitous and mobile computing. Aesthetics understood in the expanded context of an embodied experience affected by the material qualities of digital infrastructure helped to promote new poetics and imaginaries of the city.

The Invisible Geographies drifts focused on making the wireless aspects of digital infrastructures knowable by using RF antennae that made data transmissions and electromagnetic fields audible to the participants of the drift. The wireless properties of ubicomp and mobile infrastructures constitute only a small aspect of the infrastructure that enables these systems. Ubicomp and mobile computing are enabled by an integrated set of technologies that include structures such as mobile phone masts and satellite dishes, an integrated network of both copper and fibre optic cables, connected together through the meeting rooms of large data centres and carrier hotels. At the centre of London's digital infrastructure is the London Internet Exchange, with many of its most important sites physically located in East London. While the scale of East London's internet infrastructure is vast, its visibility to the residents of East London is psychologically as invisible as its radio transmissions. Drift 4,Searching for the Cloud, was organised as an attempt to engage in a search for the material presence of ubiquitous and mobile computing through these large structures, the data centres and carrier hotels that make up the London Internet Exchange.

5.2.2 Drift 3 – Searching for the Cloud

Searching for the Cloud, was a drift that linked the key East London data centres that form the London Internet Exchange (LINX) through a walk that revealed the physicality of the

infrastructure that supports cloud computing. Cloud computing is a computing paradigm that displaces personal computing, migrating computing from individual PCs and private corporate servers to vast data centres accessible over the internet (Amoore, 2018). Services hosted in the cloud are generally web based. Therefore they are easily accessible through a variety of devices with internet connections. These devices include not only desktop and laptop computers, but also cellphones and PDAs (Zhang et al., 2010). Infrastructure providers pool a large amount of resources from data centres and make it easily accessible (Zhang et al., 2010). The main idea behind cloud computing is not a new one. John McCarthy in the 1960s already envisioned that computing facilities would be provided to the general public like a utility (Parkhill, 1966). Amoore (2018) has argued that the 'cloud' in cloud computing is widely held to derive from the mapping of infrastructures of computer networks, where the visualisation of a figurative cloud stands in for the complexity of the internet. For example, see the diagram by Dodge (2004, p. 6) which shows a selection of representations of computers, servers and local area networks connected to a graphic cloud shape that stands in for the complexity of the internet. In this respect, the cloud can be considered a black box. Its inner workings are opaque; only its inputs and outputs are made visible. Zhang et al. (2010) suggests that it was after Google's CEO, Eric Schmidt, used the word to describe the business model of providing services across the internet in 2006 that the term really started to gain popularity. The definition of cloud computing by the National Institute of Standards and Technology (NIST) states that 'Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction' (Mell and Grance, 2011). However, the term 'cloud computing' has been used in a variety of contexts to represent many different ideas. This is especially true of the marketing hype used to promote and sell cloud computing services. The three components now most recognisable in the cloud are: infrastructure as a service, in which hardware, servers, storage, cooling and energy are supplied; a platform as a service, in which the software stack is accessed via the cloud; and the applications layer, in which data analytics capacity is supplied via the cloud (Amoore 2018). Kinsley, 2014, has argued that we need to move beyond the frictionless immateriality of 'virtual geographies' towards a greater attention to the material conditions of contemporary digitally inflected spatial formations (Kinsley, 2014). He argues for a greater attention to the materiality of digital geographies.

The complexity of London's digital infrastructure cannot be overstated. Infrastructures by their nature are difficult to define, and digital infrastructures consist of multiple interconnected systems. For example, mobile and ubiquitous computing cannot function

without the support of the national grid supplying electricity, mobile networks connecting devices via radio, water supplies for cooling data centres and the interconnection of multiple autonomous carrier networks. The aim of the Searching for the Cloud drift was to investigate the large structures that form the London Internet Exchange and the data centres that are located near to these sites from the perspective of the impact they have on the experience of East London. The Searching for the Cloud drift took place on Monday 25 January 2016. The meeting place was Chrisp Street market, just off East India Dock Road in Poplar, East London. The market was chosen as it was designed by Sir Frederick Ernest Gibberd as part of the 'Live Architecture' exhibition for the 1951 Festival of Britain. The drift route moved away from Chrisp Street market, along East India Dock Road to Coriander Ave, Poplar, which is one of the most significant sites in the London Internet Exchange. It then headed south-west towards key sites in Docklands and on the Isle of Dogs. The route of the drift was informed by prior research. Important sites in London's digital infrastructure were located. The London Internet Exchange (LINX) consists of two separate high-performance Ethernet switching platforms, accessible from sixteen data centre locations.[18] LINX is the meeting point of multiple autonomous physical infrastructures connecting over 850 autonomous networks from 80 countries around the globe.[19] By connecting these networks the internet exchange enables Internet Service Providers (ISPs) and Content Delivery Networks (CDNs) to exchange internet traffic between their networks.[20] The connection of autonomous networks enables access to multiple internet routes. The sixteen LINX sites represent important nodal points in London's digital infrastructure. These sites are the meeting point where data flows from one physical network to another. LINX boasts direct access to Atlantic Crossing 1 and the West African Cable System, the physical cables that connect London to the USA and Africa. These sites can therefore be seen as significant London landmarks, the contemporary equivalent of the British Telecom tower that still marks London's skyline. They are the metaphoric engine rooms of the UK's internet and are some of the core nodes that enable the global internet. The LINX website listed sixteen sites. Nine of them fell within East London and seven were in walking distance of Chrisp Street Market.

Our first destination was Coriander Avenue, a 15-minute walk from Chrisp Street Market, on the south side of East India Dock Road. Coriander Avenue is a nexus point in the London Internet Exchange and, by definition, within the UK's internet infrastructure. Coriander Avenue and its surrounding streets, Saffron Avenue, Nutmeg Lane, Rosemary Drive and

[18] LINX London Network. [online] Available at:: https://www.linx.net/about/our-network/ [Accessed 1 May 2019]
[19] The London Internet Exchange [online] Available at: https://www.telehouse.net/london-internet-exchange [Accessed 1 May 2019]
[20] 'The Art of Peering - The IX Playbook'. Available at: http://www.drpeering.net/white-papers/Art-Of-Peering-The-IX-Playbook.html [Accessed 1 May 2019].

Oregano Drive, house four of the LINX data centres: Telehouse North, Telehouse North 2, Telehouse East and Telehouse West. Alongside the four Telehouse data centres is the Global Switch campus, comprising two data centres that offer cloud computing services, Global Switch London East and London North. From Coriander Avenue we headed south-west towards Docklands. Our first location was Digital Realty's Sovereign House, located at 227 Marsh Wall. We continued to head south-west towards Millwall's outer dock, where we were looking for Equinix L8 at Harbour Exchange. Outside Equinix, we had the good fortune to meet one of the senior telecomms engineers. He agreed to meet us later in The George pub for his dinner break. We continued the drift to the west side of Millwall's outer dock to our final data centre, Digital Realty's Bonnington House. The drift's final destination was The George public house on the Isle of Dogs, where we met the telecomms engineer from Equinix.

Reviewing the notes and recordings made while participating in the drift, three significant aspects emerge:

1) The Affect of Infrastructure
3) Infrastructure of Imagination, Fantasy and Desire
2) Infrastructure as Labour

I will outline these themes separately.

The Affect of Infrastructure

Affect is the most basic bodily response to a space. It is felt rather than conscious. Crossing East India Dock Road and entering Nutmeg Lane, the most striking response was felt, a pre-rational sense that passed between us. It was unspoken, yet it instinctively altered our behaviour. We became quieter and walked closer together on the street. The streets were empty and eerily quiet given their location adjacent to the A13. We responded by stopping talking, both picking up a little pace as we walked. I was carrying my camera and zoom audio recorder. I had taken photos of the architecture at Chrisp Street Market, but I felt too intimidated to photograph Nutmeg Lane or Coriander Avenue. The quietness revealed a perceptible hum of electricity that gave the environment a paranoid soundtrack in our heightened state. The streets are straight, wide and open. They are lined on both sides by the high-tech architecture of streamlined aluminium and glass. There are minimal ground-level features or signage. All of these features work together to guide your attention away from the large data centres and to your own presence within this landscape. They make you self-conscious, more aware of your own body and its presence within the environment. I noticed CCTV cameras thinly disguised as streetlamps, complemented by more obvious white

cameras mounted at regular points along walls of the grey high-sided buildings. I felt that our presence there might be challenged at any moment. It was only when we reached the water feature that runs alongside Saffron Avenue, with its public benches and fountain, that we started to ease our pace. We sat on one of the benches with our backs to the buildings and discussed the experience. We started to rationalise the experience, describing our feelings and articulating them through clumsy representations such as, 'It felt like we were being watched'.

Of all the drifts organised as part of my research, I had the greatest affective response to this location. This is one of the premier sites that form the UK's internet infrastructure, yet this fact is not advertised. These building are anonymous and secretive and induce a self-consciousness in those who enter their terrain. Londoners have become accustomed to 'quasi-public space' (Pratt, 2017) sometime referred to as Privately Owned Public Space (POPS) (Kayden, 2000). These are open spaces that look and feel like public places, open to all; however, they are in fact private spaces that are only conditionally made available to the public (Pratt, 2017). Examples in London include Granary Square, White City Place and Canary Wharf. The site occupied by the Telehouse and Global Switch campus is an intensification of this process. Here there are no official signs barring entry; however, a clear affective zone has been constructed through the architecture of the buildings that produces an overwhelming ambience of hostility, security and surveillance. This is in stark contrast to the opposite side of East India Dock Road which contains a sprawl of low-rise social and former social housing. I do not aim to fetishise the social housing estates and Brutalist architecture of the north side of East India Dock Road; they can also produce some tension in walkers not accustomed to the claustrophobia of large-scale post-war housing estates. However, the contrast between the two environments is striking. Crossing East India Dock Road is an aesthetic experience that disrupts temporalities. It is a shift from the embodied experience of post-war social housing expressed in the materiality of concrete, dust and the traces of lived lives to a streamlined high-tech modernism of empty streets lined with grey brick, anodised aluminium cladding, plate glass, CCTV cameras and the continuous hum of air conditioning. It is a shift in ambience from a territory of habitation and occupation to one of absence; from a sense of public space to the uncertainty of belonging. The contrast between the experience of standing on Rosemary Drive, experiencing the weight of the exclusionary facades of the Global Switch and Telehouse data centres, and the poeticised ephemeral imaginary of cloud computing is striking.

What was apparent from the walk was that East India Dock Road marks a clear affective shift in experience. It functions as a border between two contrasting ambient zones experienced

more through the sensorium of the body than through rational representation. In Chapter 4, affect was defined as the ability to affect and be affected and I suggested that the practice of the drift could be a valuable site of research for the study of affect, within both mobile and ubicomp research and cultural geography. The concept of affect is disputed within cultural geography. Steve Pile (2010) has argued that there are two distinct camps which he defined as non-representational theory (sometimes referred to as affective geography) and emotional geography. While the characterisation of a clear binary between these two branches of geography can be challenged, (Curti, et al, 2011; Dawney, L. 2011) he does outline an important theoretical distinction. Fundamental to the disagreement is the relationship between affect and representation. Pile (2010) summarises by claiming that 'emotional geography is focused on a psychological subject, where thoughts and affects are entangled in complex and devious ways; in contrast, affectual (non-representational) geography is focused on the non-psychological subject, where affects are always already ungraspable and unpresentable by thought.' In emotional geography there is a relationship between affect, expressed emotion and thought, even if this connection is in a disguised and opaque form, whereas in non-representational theory affect cannot be attached to, or emerge into, thought. In non-representational theory, thought and emotion are detached from affect. Drawing on the experience of the drifts presented in this chapter and Chapter 4, this thesis argues that affect as a relation between bodies and bodies and/or bodies and the environment cannot be expressed through representation; however, representations emerge as a response to a body being affected. The Invisible Geographies drift exposed how new spatial poetics emerged from the aesthetic experience of the drift. Participating in the Searching for the Cloud drift revealed a similar process. I will use the encounter with the Telehouse campus to illustrate my argument.

Before the walk, it was the narratives produced by agencies marketing and advertising cloud services that predominantly informed my understanding of cloud computing. Cloud computing conjures an image of data everywhere, light and ephemeral: an immaterial, unsituated phenomenon. I knew this was nonsense: I had carried out internet research into the locations of the London Internet Exchange and located key sites, but I did not have a tangible alternative to the 'cloud' narrative. It was through the experience of walking East London's digital infrastructure that a distinctly different representation of cloud computing started to emerge, through both experience and conversation. The walking practices of psychogeography placed us in direct confrontation with the material reality of the buildings that house the infrastructure of cloud computing. This was an intensely affective experience. We were directly affected by the material reality of the environment, but we also affected this environment. Affect is not a passive experience. Our presence within this terrain also had an

impact. For example, how did the security staff tasked with monitoring CCTV cameras respond to our nervous walk? Did our presence alter the ambience of the environment? I have no way of knowing how we affected the environment, so what I want to focus on is how the experience affected our spatial understanding of cloud computing. By spatial understanding I am referring to the whole range of ways in which we make sense of a site. This includes embodied experiences of sites such as perceptions, feelings, and emotions. It also includes social interactions and representational knowledge, such as spatial narratives. Spatial understandings are therefor in a constant state of being formed and reformed. Spatial understanding in this context is congruent with what Farman (2015b) describes as 'sensory-inscribed' embodied identity. He writes that 'My sense of embodied identity is not simply gained through social interactions with other humans; instead, it is continually constituted by what I term a "sensory-inscribed" engagement with people, objects, social and cultural structures, protocols and the spaces produced through the interactions among these things' (Farman, 2015b).

Affect cannot be fully articulated because it is a relation between at least two bodies. On the drift the environment had an affect on both Laura and me. Affect is therefore the relation that flowed between me, Laura, and the environment, and therefore cannot be adequately expressed in its totality from any singular perspective. But the impact of being affected is very real. To be affected by an environment is to disrupt, or confirm, spatial understandings. Spatial understandings are confronted with the reality of the environment. The poetic ephemeral imaginary of the cloud is forced to confront the oppressive weight of the data centre, and the result of this encounter is to trigger a process of disrupting my spatial understanding. Viewed from the experience of the Searching for the Cloud drift, affect is a transformative process. The flow of experience between bodies and environment disrupts both the environment and our bodies, starting a process of forming new understandings that present themselves as feelings, emotions and representations.

One of the most significant aspects of psychogeographical practices is to instigate an encounter between a group of people and their environment. The affect that occurs between the bodies of the participants and the environment during such an event creates the potential for new spatial understandings, new poetics, to emerge. The two drifts presented within this chapter both expose an important correlation between the embodied and affectual experience of the materiality of digital infrastructures and the production of imaginaries of urban space. The experience of the drifts suggests that both representational and affectual processes structure the production of urban space.

Infrastructure of Imagination, Fantasy and Desire

Once on the outskirts of this strange location, as the anxiety started to subside, we reflected on the experience of walking the data centres. We talked about the location and its architecture and we started to mythologise the aesthetics of data centres, the security culture, their potential as sites for terrorism or political occupation. In 2007, Telehouse had been the site of a foiled Al-Qaeda plot.[21] Security is one of the key reasons these buildings are designed to be anonymous. Farman noted the difficulty he experienced in finding the entrance to the Equinix data centre on the outskirts of Washington, DC (Farman, 2015b), and this is mirrored by Andrew Blum in his book *Tubes: a journey to the center of the internet*. Blum's experience is insightful, describing his visit to the Equinix campus in Ashburn, Virginia, United States. He writes. 'When I showed up, I had trouble finding the door […] I saw no proper entrance to speak of and no signs, only blank steel doors that look like fire exits […]When I finally found David Morgan, the director of operations of this complex, he saw no reason to apologize. On the contrary, confusion was his goal: 'customers are reassured by the anonymity of the place'[…]' (Blum, 2012, p. 90).

Laura Grace Ford responded to the Searching for the Cloud drift through a piece of writing. In one fragment she writes: 'Grey silos looking like sealed conference centres. You know, they house data systems, servers; the entire financial-services industry entombed, encoded in these eerie drome's – Selco, Global Switch – if you wanted to do something really mental, you could do that place. Grilles, cooling systems, disaster-aversion strategies'.

Psychogeography as an arts practice differs from both affectual and emotional geography in that it takes the poetics of site as an essential part of its practice. Psychogeography is an opening up of the body to the felt experience of a site, to its unique affective tonality. However, psychogeography is also interested in the representations that flow from this experience, the poetics and narratives of site. While psychogeographical arts practices have many common goals with both affectual geography and emotional geography, where they differ is in the importance placed on the representations that are produced in response to the affectual experience of walking. I am not claiming that the affectual experience of a site can be accurately or faithfully represented by psychogeography. I am arguing that being affected by the experience of a site influences how we understand and represent the site. The paragraph of text above, written by Laura, carries something of the claustrophobia, paranoia

[21] In 2007 an Al-Qaeda plot to destroy a key London internet exchange was foiled. See Jackson, M. 2017. 'Report warns UK undersea fibre optic data links vulnerable to attack', *ISPreview*, Dec. 4th [online] Available at: https://www.ispreview.co.uk/index.php/2017/12/report-warns-uk-undersea-fibre-optic-data-links-vulnerable-attack.html [Accessed 26 May 2019]

and excitement of the experience. I read the quickening of the pace of our walk in its form. This is a psychogeographical response. Laura's text poeticises these core digital infrastructural spaces. Psychogeography actively engages in producing city imaginaries, and this is the political terrain in which its practices operate. By seeing infrastructure not only from the technical perspective but also from the poetics of infrastructure enables the imaginaries produced by psychogeographical practices to be seen against, and as part of, the wider practices of spatial production. We can therefore place psychogeography's affective practices in dialogue with Larkin's (2013) aesthetics and poetics of infrastructure. Affect is the relation between walkers and the materiality of their environment, whereas aesthetics is the experience of being affected by the materiality of their environment. Aesthetics is akin to what Massumi describes as a 'thinking-feeling' (Massumi, 2015 pg. 66). It is the combined thinking and feeling that is experienced as an event unfolds. This is a thinking of perception in perception, in the immediacy of its occurrence, as it is felt (Massumi, 2008). Poetics of infrastructure, on the other hand, are the reflective spatial imaginaries which form in response to aesthetic experience. Spatial imaginaries are the self-reflexive representations that occur as we contemplate and discuss the aesthetic experience of being affected by the material world. For example, as Laura and I walked between the Telecity campus we were affected by the material reality of the data centres. As we sat on the bench overlooking the fountain, we discussed and reflected on forming new special imaginaries.

Larkin (2013) highlights the link between the poetic and political role played by infrastructure. He spotlights the dreams and desires it can induce within populations and the political power this can have. In recent history, telecommunication has played an important political role. Not just from a technical perspective but also for its poetic imaginaries. An example is the political and aesthetic value of the USSR's first satellite, Sputnik I. Or the erection by the German Democratic Republic (GDR) of the Fernsehturm (television tower), in former East Berlin. The political value of both these technologies was as much in their symbolic power as in their technical capabilities. Infrastructures not only carry out technical processes; they also function at the level of fantasy and desire. Such an observation is not limited to authoritarian regimes; it also functions in the way ubiquitous and mobile computing have been presented and promoted. Terms such as smart city, everyware computing, Internet of Things and cloud computing are all acts of poeticising digital infrastructures and their services. These are the major narratives that represent the infrastructure of ubiquitous and mobile computing. They project a sense of what it is to be modern in the contemporary moment. They embody objective historical forces and possibilities presented by technical developments, but they also enter into the unconscious and present themselves in the imagination. Psychogeographical practices, by directly engaging in the poetics of

infrastructure, produce their own counter-narratives, minor narratives that challenge and make visible the major narratives of digital infrastructure.

Infrastructure as Labour

Central to my own art practice is the organisation of events that extend psychogeographic practices by orientating them towards the digital aspects of the city. In response to the drifts, I produce drift reports, fragmented, poeticised and mythologised fictions that document the experience of walking the digitally expanded city through image, text and sound. The drifts are collaborative and attempt to leverage the multiple perspectives that arise from walking with others. The drift reports are personal and subjective, but draw from the collective experience. Psychogeography consciously welcomes the accidental encounter, the unexpected and the serendipitous. This is a technique used effectively by psychogeography's literary practitioners, who use encounters to narrativise their particular vision of urban space. For example, Iain Sinclair uses encounters with characters such as Brian Catlin to forge an occult London (Sinclair, 1998). While searching for the Equinix LD8 data centre at Harbour Exchange we had the good fortune to meet one of the data centre's senior technicians and this meeting gave us a fascinating insight into another imaginary, that of the technicians who configure and maintain East London's digital infrastructure. The technician became our intercessor between the inside and outside of the data centre, partially opening the black box of the cloud through his cognitive map and spatial imagination developed through an intimate relationship with the developing technologies of the internet and cloud computing. I present elements of our meeting here, not as a claim to truth – I have no way of verifying his account – but because of the important role it played in inspiring my spatial imagination.

Equinix LD8 is located within the Harbour Exchange building, Docklands, London. The building is as spectacular as it is discreet. It is eight storeys high and constructed from oblong structures that are completely covered with square deep blue mirrored windows that allow it to vanish into the pixelated reflections of its surroundings. The metaphor of cloud computing has been integrated into the form of this building. As you stare up at its towers you are greeted by a fractured image of the sky. This gives the building a lightness missing from the Telehouse and Global Switch campuses. As we approached number 6/7 Harbour Exchange, we couldn't find any trace of the Equinix LD8 data centre, one of the key sites in the London Internet Exchange. The presence of Equinix is not advertised outside the building. We questioned a worker smoking a cigarette at the far end of the building and he confirmed that the Equinix data centre was housed inside. The worker turned out to be one of the data centre's engineers. He was as intrigued by our walk as we were about the Equinix data centre. The engineer agreed to meet us in a nearby pub to discuss Equinix and the London Internet

Exchange. He agreed to let me record our conversation and use it within my research and art, provided it was anonymised. I will refer to him in my thesis using the pseudonym Ciaran.

If East London's digital infrastructure has been rendered invisible within everyday experience, then the human labour that enables it is even more remote, hidden behind the reflective glass of buildings like Harbour Exchange. What became apparent from our conversation was that digital infrastructure is in a constant state of production and repair, a process more generally outlined by Amin and Thrift (2017). As the following extract emphasises, human labour is required twenty-four hours a day to produce and maintain the continued functioning of the digital systems that enable ubiquitous and mobile computing. '*You have technicians working shifts because the internet is 24/7. Let's say your machine was overheating and you needed it rebooted, and it's not been rebooted for a while. You need someone there at night-time to do it for you. Or you might need a fibre patch putting in. ... a while back ... there was an earthquake in Taiwan. And I was working night shifts myself. And I got a phone call. The earthquake had happened and I had to reroute two patches in the meet-me room to take us down a different route across the world. Like, you know?*'.
John – '*yeah*'.
Ciaran – '*There was a company called TransTelekom and they route the circuits through there. Cos their fibres go*'
John – '*So you are physically re-routing?*'
Ciaran – '*Aye. It's just a 10-metre patch, or something, in our meet-me room to take it from one customer who was affected by the earthquake to another customer who has fibres that go across the Trans-Siberian Railway. And that can reroute circuits right across the world, right. You know? It's just connecting to another customer who has a different router for their fibres*'.

It is clear from this conversation that digital infrastructure includes and is fundamentally dependent on the human practices of those who enable it through their labour. In one small room, located at the top of the Isle of Dogs in London, data can be redirected from one route across the globe to another using a 10-metre patch cable. Disruptions to services are manually mitigated through the actions of the engineers. In this respect the engineers are not maintaining a technical system, they are an active element of the technical system. Star and Ruhleder (1996) have argued that infrastructure is a fundamentally relational concept. It becomes infrastructure in relation to organised practices. And these practices exist in a social and political context. It this respect we can argue that digital infrastructure consists of techno-social assemblages. These are technologies and people that combine to work as heterogeneous yet functional wholes (Woodhouse and Patton, 2004, p.4; Fuchs, 2007, p. 97;

Raffl, Hofkirchner, Fuchs and Schafranek, 2008). Digital infrastructure can be seen as a substrate that enables the social practices associated with the use of ubiquitous and mobile computing; however, this substrate itself is not a fixed entity but is relational and dependent on the social practices of networks of people that produce and reproduce the digital infrastructures.

Ciaran's conversation inspired us to see East London's internet infrastructure from a new perspective, which included a global network of routes served by key data centres, dark fibres running under East London's streets and a micro-spatial politics of zones within the data centre. I will look at each of these aspects individually.

Ciaran refers to data centres as Internet Business Exchanges (IBXs), and explains that different IBXs have different connections to other global sites. While the IBXs are owned by different corporate interests, they function together as a single system. The IBXs are connected to each other by fibre-optic cable that enter the IBXs in meet-me rooms. The meet-me rooms allow data to be rerouted through different IBXs or allow connections between equipment located within in the different sites. Ciaran knows which IBX you would need to route through to connect equipment in Equinix LD8 to other sites around the world. For example, he explains: '*So you could set up a data company, a business, whatever sort of business, you put a couple of servers in there, a couple of fire alls, and you say I want to connect to someone over in America… and you would use COLT Telecom, It'll take your dark fibre out over to New York or something. You know what I mean? You would connect through different third parties to take you over there'*.

Ciaran explained that different sites have different global connections. Some connect through to the same countries but use different routes to make the connections. There is a network of dark fibre that runs under the streets of East London, allowing connections to be made between IBXs. He explained the role of dark fibre. When telecommunications companies lay fibre-optic cable, they lay extra cable to mitigate the future cost of having to lay it again. Dark fibre refers to these unused fibre-optic cables. The dark fibres are leased to companies who want to establish connections between locations. Ciaran explained that there are pits in the road where you can connect to the dark fibre. By splicing between different sites connections can be made directly between buildings in the city, but also internationally.

Ciaran - *'So you can have equipment in our data centre and you can have equipment in another data centre. You might want to make a connection. The way you make a connection is through dark fibres that would link to that other site. ... So you've got all these pits in the*

road. You bring them [the dark fibre] *into our building and then they can splice them in the road and take them into another building and that gives you connectivity, you know'.*

Ciaran's cognitive map of East London included the key IBX sites and knowledge of their global connections. He also had a good understanding of the key optical fibre network running below East London and the access pits that allow connections to be made between the buildings. On the walk back to Equinix LD8 from The George he pointed out the pit in Harbour Exchange Square were Equinix makes its connection to the fibre optic network.

Equinix LD8 is like many of the IBXs is a colocation space. Colocation is the practice of providing space, power, connectivity and technical support to house privately-owned servers and networking equipment. Equipment owned by different clients is located within the IBX. Small companies rent racks, while those requiring large amounts of equipment rent cages. The cages for very large corporations occupy whole zones in the centre. Some of the larger clients hosted by Equinix are Facebook, Amazon and CISCO.

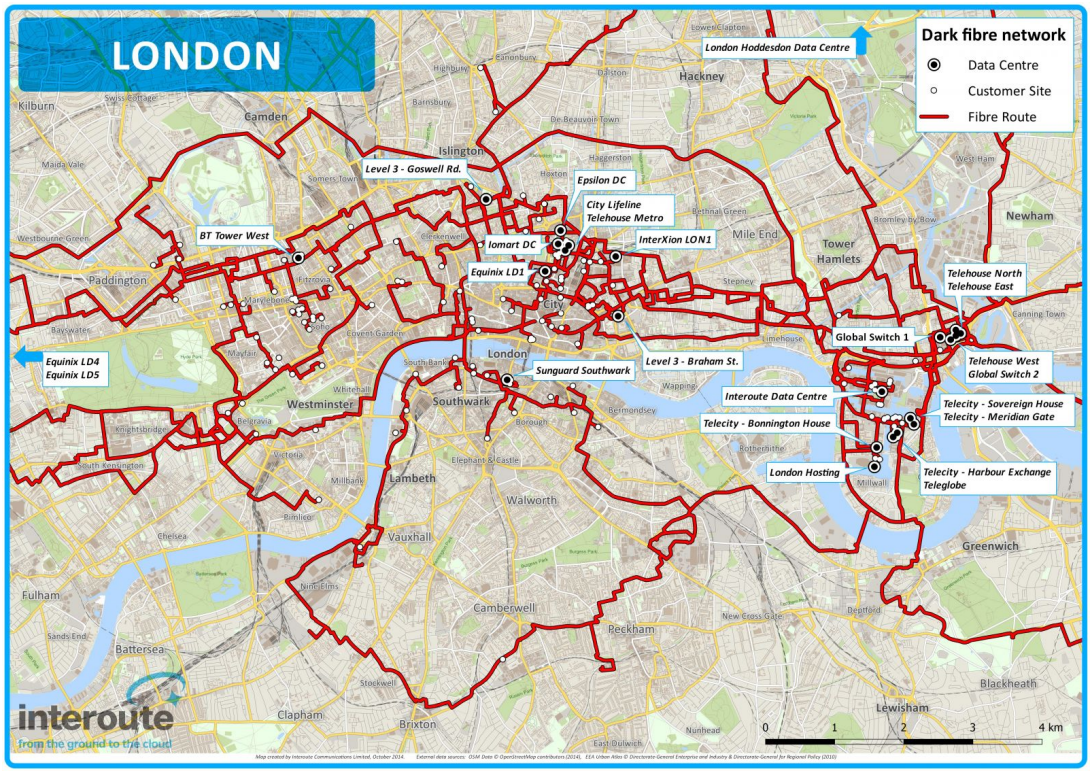


Figure 9 - Interoute - London Dark Fibre Network (Telecity – Harbour Exchange is now Equinix LD8)

One of the most intriguing aspects of the conversation with Ciaran was his description of the micro-politics of zoning within the Equinix data centre itself. Ciaran outlined what I would describe as psychogeographical zones within the data centre; areas that have different entry requirements or their own security and surveillance protocols. For example, some zones have

time restrictions on entering or require special passes, and some have twenty-four-hour CCTV connected directly to the corporate headquarters of the client. Ciaran provided a number of examples. One of the most striking was Amazon: '*See wi Amazon, right. You can't just go into their area. Your got to phone them up in Dublin. The reason they're in Dublin is 'cos they don't pay fuck-all corporation tax. Same as a number of companies have their headquarters in Dublin. Dublin offers low corporation tax. So they don't pay any bills. Our headquarters are in Dublin. The rest of the business is in the UK. So as soon as you want to go in there they've got to phone up Dublin. We got a number of badges. You give the badge's number to go in there. They've got a camera in there which goes right back to Dublin. They've got alarm systems all round it. A pain in the arse you know?*'

The Amazon example highlights two related spatial regimes. Firstly, the Equinix LD8 data centre contains internal security zoning, which has a concrete effect on those who work within the centre. Secondly, this example highlights the spatial relationship between Amazon as a corporate entity and its technical infrastructure. The technical infrastructure is located in East London while its corporate infrastructure is located in Dublin. What this exemplifies is that technical infrastructure cannot be separated from its spatial, economic and political context. These aspects are relational and have a direct relationship on each other. The business infrastructure enables the technical infrastructure; however, the economic protocols of the UK and Ireland provide an incentive for spatial separation between the business aspects of Amazon and its technical functions.

I want to conclude the discussion of the conversation with Ciaran by returning to some of the wider themes of psychogeography in the digitally expanded city. Ciaran provided a glimpse into his own psychogeography of East London's digital infrastructure. He exposed the nodes of IBXs connected through networks of lit and dark fibre. He has mapped the internal zoning of the Equinix LD8 and implicated the technological infrastructure in wider business and global political structures. It has become clear that Ciaran himself is an integrated part of the digital infrastructure. His own spatial imaginary of the local and global internet infrastructure is essential to its ongoing production and maintenance. Ciaran and Equinix LD8 are physically situated within East London and play an active role in production of its everyday ambience. The Canary Wharf commercial estate defines a distinct territory in East London, sited between the A13 East India Dock Road and running along the north side of the Isle of Dogs. This development is centred on the fifty-storey skyscraper One Canada Square which marks one of the main financial centres of the United Kingdom. The seven data centres are located on the periphery of this development. Their anonymised frontages and security cameras define a shift in territory from the surrounding social housing estates of Poplar,

Cubitt Town and Millwall. These are areas which, because of the historic decline of the docks and print industries, house an impoverished working class. The contrast between the wealth of the Canary Wharf development and its surrounds is stark, and many of the issues associated with gentrification, which played an important role in Chapter 4, are intensified: for example, the disappearance of pubs that service working-class people, or the shortage of affordable housing. While data centres service the global flow of finance and data, the data centres themselves are situated in, and have a very real impact on, the production of space of East London, an impact that functions on the technical, social, cultural and political level, which all impact on the very real psychic experience of East London. Digital infrastructure functions simultaneously at the micro and macro spatial level. It is simultaneously local and situated, playing a role in producing the space of East London, while simultaneously facilitating the movement of data around the globe, playing a role in producing space on a planetary scale.

5.3 Conclusion

This chapter has presented two case studies: 1) 'Invisible Geographies' and 2) 'Searching for the Cloud'. The analysis focused on answering the research question; *What can a psychogeographical art practice reveal about the role infrastructure plays in the production of the digital expanded space of East London?*

I explored this question by organising two drifts that extended the usual practices of psychogeography by disrupting the participants' typical relationship to digital infrastructure. The first, 'Invisible Geographies', provided walkers with RF receivers that enabled them to listen in to the radio transmissions of digital devices. The second, 'Searching for the Cloud', encouraged participants to explore East London's key physical sites that form the London Internet Exchange. My research found that a psychogeographical art practice revealed the important role affect, aesthetics, poetics and social practices play in the production of the digitally expanded space of East London. In this conclusion, I will explore how these core findings work together conceptually to contribute to the discourse within spatial theory and ubicomp and mobile computing around issues of invisibility and embodiment.

Chapter 4 found that digital infrastructure is rendered invisible within the everyday experience of the city. The combination of the two drifts, analysed within Chapter 5, have revealed how the invisibility of digital infrastructure is rooted both in the theoretical origins of ubiquitous and mobile computing and by post-9/11 security concerns that form the political climate within which they have developed. Security concerns are particularly central to the invisibility of the sites that form the London Internet Exchange. However, this chapter argues

that an HCI disciplinary reading of Heidegger's phenomenology, and in particular his concepts of 'ready-to-hand' and 'present-at-hand' is at the core of a wider digital infrastructural invisibility and the creation of 'blackbox' entities such as the cloud. In Heidegger's terminology, equipment is 'present-at-hand' when the user is conscious of it: when the user's attention is focused on the equipment in-itself. When equipment is used to carry out a task it has a tendency to disappear from consciousness: it is, in Heidegger's terms, 'ready-to-hand'. The move from 'present-at hand' to 'ready-to-hand' is the move from visibility to invisibility. As ubiquitous and mobile computing increase, the invisibility of these technologies raises important ethical and political questions. For example, if the aim of ubiquitous computing devices is to 'weave themselves into the fabric of everyday life'(Weiser, 2002), how does a society consent to such vast harvesting of data from everyday life if the technology remains invisible? Extending the psychogeographical drift through the use of RF antennae and walking key sites that form the London Internet Exchange helped to orient the participants' attention towards the material qualities of digital infrastructures. This is one of the fundamental strengths of using a critical artistic practice within spatial research. It encourages the everyday to be viewed from new perspectives. It can foreground the overlooked, the marginalised and the invisible within the urban environment. My psychogeographically-inspired drifts engineered events within which participants confront the materiality of the digitally expanded city. Perhaps the single most important finding these two studies have revealed is that the aesthetic experience and poetic imagination afforded by the material reality of digital infrastructures questions the present-at-hand /ready-to-hand, visible/invisible binary favoured by some HCI design literature. Before moving on to look more specifically at the way this argument relates to the production of space of East London, I will provide a simple example, driving a car, to illustrate my argument. As I drive my car on a long journey, the control of the car becomes automatic. I am not conscious of every move of the accelerator, mirror check or twitch of the steering wheel. People describe this slippage from consciousness as 'driving on autopilot'. This is typical Heideggerian tool use. My consciousness is not focused on the materiality of the car: the car itself becomes invisible to consciousness as I concentrate on its use as a tool to get me from A to B. However, does the actual form of the car, beyond its technical function, disappear from consciousness? If so, it would make no difference to the experience whether the car was a sports car or a clapped-out old banger. But the aesthetic experiences, i.e. how it feels to drive, and the poetic experience, i.e. what imagination it produces in the driver, remain an important part of the experience. My argument is not that tools don't retreat into consciousness through their use. It is that such a process is not a clear black-and-white binary. The materiality of the tool has aesthetic affordances which continue to produce affects during tool use. The aesthetic and poetic affordances of the car's materiality also affect the experience of other road users and

pedestrians far beyond the car's technical function as a tool of transport. The car plays a role in producing the ambience of everyday life.

The two very different drifts analysed within this chapter both found that the materiality of digital infrastructures plays an important role in producing the ambience of everyday life. The affective properties of digital infrastructure were particularly pronounced in the physical sites that form the London Internet Exchange, especially the Telecity and Global Switch campus. What was apparent from the Searching for the Cloud drift was that East India Dock Road marks an affective border between two starkly contrasting environments. These large data centres produce an eerie, securitised atmosphere that is experienced primarily as felt rather than rationalised. These structures hide their presence. However, in doing so they create affective zones. It is through the experience of walking East London's digital infrastructure that an embodied understanding of the materiality and ambience created by digital infrastructures started to be understood. My research argues that an expanded psychogeographical art practice revealed the affective qualities of East London's digital infrastructure. Affect has been defined as the ability to affect and be affected. It is therefore a relation between things, and cannot be understood from a singular perspective. I have described the problematic issue of the invisibility of digital infrastructure and its origins in HCI's interpretation of phenomenology within its disciplinary design literature. The psychogeographically-inspired practices I have presented in this chapter share much territory with phenomenology, particularly the recognition of the importance of the whole sensorium of the body in understanding spatial relations. Where my research findings differ are in the centring of the individual perspective. As Farman (2015b) writes in 'The materiality of locative media', 'phenomenology, […] can be seen as giving an overemphasis to the individual rather than the community or others that are able to exist beyond our realm of understanding'. The psychogeographic practices I have developed within this chapter are always participatory. The walks are never solo, and they attempt to engage the technical other beyond immediate perception through strategies that reveal material aspects of digital infrastructure. Within these practices, affective experience disrupts the individual perspective. The individual is affected by the interaction with other walkers and the material reality of digital infrastructure in its spatial context. Affect is the relation between walkers and the materiality of their environment, and while affect as a relation cannot be articulated in its totality, aesthetics is the experience of being affected.

Aesthetics is here understood as a bodily reaction to an affective interaction. It is a form of cognition, achieved not only through taste, touch, hearing, seeing and smell, but also through those other sensors that are less easily articulated, such as intuition, anxiety or the thinking,

that accompany feeling in the immediacy of an event. On the Invisible Geographies drift the material properties of data transmissions were revealed by making them audible. This enabled new embodied understandings to be produced that combined the specific spatial and sonic properties of the data transmission with the properties of the site. The Invisible Geographies drift exposed that items of digital infrastructure have their own aesthetic qualities, unrelated to their technical function. For example, the aesthetic quality produced by the pulsed transmissions of wi-fi has a different aesthetic quality to the high-pitched signal of 4G mobile communications. These aesthetic qualities have an impact on how participants responded to certain technologies, and because the transmissions were always experienced in particular locations the combination between site and signal altered how the participants felt and understood the spaces of the drift. Aesthetics are experienced in the real time of an event; poetics, on the other hand, are the reflective spatial imaginaries which are formed in response to aesthetic experience.

I have shown that there is a direct relationship between affect and the poetics of spatial imagination. Being affected by digital infrastructure is the moment of potential which inspires subjective and intersubjective spatial imagination to emerge. Put more simply, events in which people experience the materiality of digital infrastructure in new and unexpected ways inspired new spatial imaginaries. A focus on affect and the way it inspires subjective imagination shifts the focus from the individual perspective towards the relation between things, between bodies and other bodies and bodies and their environment. The use of RF receivers exposed a whole network of interactions between digital devices beyond our bodies' ability to perceive them. It reveals the technical other that is active in the city. Our own digital objects were exposed as being implicated in a whole set of machine-to-machine interactions far beyond our personal use of these technologies. For example, my own mobile phone regularly broadcasts and receives data, even when I am not using it. Participants started to develop their own spatial imaginaries by listening to the sound of these transmissions. These were sometimes analytical, trying to grasp technical meaning from the experience, but they were mostly technically inaccurate, gravitating towards the poetic. The unifying finding across both drifts is that spatial imaginaries emerge through affective exposure to the material reality of digital infrastructure. Affect should therefore be seen as a relation between the virtual and the actual space of the digitally expanded city.

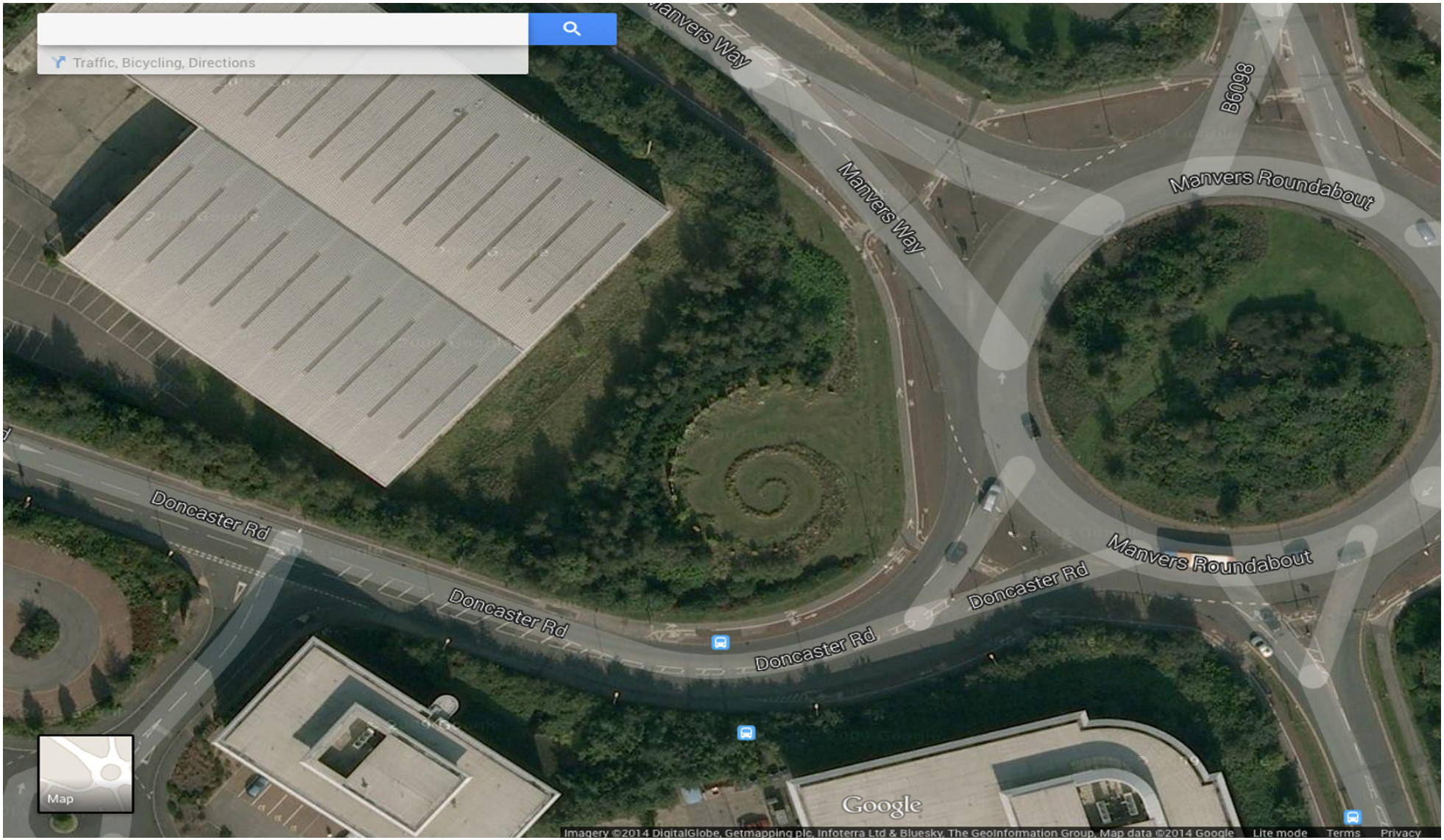
I concluded Chapter 4 by suggesting the value of conceptualising urban space in terms of its virtual and actual properties and the social practices that bring them into productive interaction. Conceptualising the city in such terms raised an important question within my research. How should the virtual and actual be considered in relation to ubiquitous and mobile

technologies? Actual space was defined as the matter that forms the world and the bodies within in it that exist beyond perception or observation, and that is in a constant process of change. The actual space of ubiquitous and mobile computing is the material reality of its infrastructure, its twisted pairing of copper and fibre-optic cables that lie below East London, the data centres discreetly hiding in plain sight just off the A13, wi-fi routers, the telephone masts that first caused protest and have now slipped out of consciousness, the satellites orbiting the earth, the radio transmissions and the human labour that enables these technologies. The actual space of ubiquitous and mobile computing should not be viewed as a passive substrate. The materiality of digital infrastructure manifests affective capacities and affordances beyond its technical function.

The virtual space of ubiquitous and mobile computing is, therefore, the imaginaries that arise through social practices that engage with these infrastructures, either through the use of technologies such as mobile phones, the practices of the engineers, such as Ciaran, who constantly produce and reproduce the infrastructure itself or the emergent imaginaries that were produced through the experience of the two drifts presented here. The drifts analysed within this chapter attempted to expose their participants to the affective quality of digital infrastructure; to their actual space. If the actual space of digital infrastructure is its materiality, then being affected by the aesthetics of actual space inspired new spatial imaginaries to emerge: new virtual space. The experience of the two drifts did not inspire a singular imaginary; it produced a multiplicity of varied imaginaries. The participants actively formed alternative realities around sites and their digital infrastructures, and I would argue that this is a necessary step in bringing the invisibility of underlying infrastructures into the public imagination. This is a necessary process if we are to develop a politics and ethics capable of responding to the challenges posed by the introduction of ubiquitous and mobile computing to urban space.

6 Potential Space

6.1 Practice Insert 3 – ‘The Manvers Main Complex’


Traffic, Bicycling, Directions
Manvers Way
B6098
Manvers Roundabout
Manvers Way
Doncaster Rd
Doncaster Rd
Doncaster Rd
Doncaster Rd
Manvers Roundabout
Map
Google
Imagery ©2014 DigitalGlobe, Getmapping plc, Infoterra Ltd & Bluesky, The GeoInformation Group, Map data ©2014 Google
Lite mode
Terms
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<<< The Manvers Main Complex >>>

Digital Drift
Sunday 16th November 2014

Digital Drifting

The streets look how I remember them but everything has come to a standstill.
.
Time itself has stopped.
.
Crystallised.
.
Space and time have always been inseparable, but here the whole network of streets has petrified. Space captured in a single moment of time, though on closer inspection it's not a single moment; it's a patchwork of distinct isolated moments, stitched into a continuum from noncontiguous shattered fragments.

Are these the moments the streets ceased to exist? The moment just before a great flash of blinding light sweeps away everything in its path. SERVER CRASH, POWER OUTAGE, TERRORIST ATTACK. I hover above this final moment. Looking down on the world as it was. From this scopic perspective, I am a god but I cannot resist descending. I join the ghosts, I walk amongst them, stare for far too long at their blurred faces, look for signs of recognition, someone I know. What sort of world do I inhabit when the faces of its residents have been obscured, leached of detail? I spot a familiar outline riding a bicycle. Instant recognition but their deformed features make me feel uneasy. I travel down streets I will never actually visit in lumbering blurs of acceleration, anticipating the next scene to emerge from the slow blocky fog as the screen renders into focus. The streets are bathed in eternal sunlight. I can feel its heat penetrating my screen, forcing a hallucinatory pink hue onto my peripheral vision. I look at buildings I will never enter, stare at people I will never speak to. Two People Talking Behind A Wall. A secret liaison documented for any jealous lover to track down. Who needs the NSA, FBI, MI5? I remember Robin Bale, a friend of mine, once recounting how he had shown his Dad Street View. He described how he spent an evening scrolling up and down Ashford high street, 'we knew that my mum, who had only died a month ago, used to walk here every day to get the papers and fresh bread … So we were looking for that digital smear… we were looking for that ghost'. How many others have traversed the virtual streets looking for ghosts? Hoping for a last glimpse, the possibility of one last meeting, a final goodbye. I contemplate the possibility of the emergence of a street view cult of remembrance.

I look up into the sky. The sun is still shining, COPYWRITE GOOGLE.

Stolen Time

In recent months I have become what you could describe as a Cyberflâneur, escaping the prison of my desk-bound workplace by indulging in daily digital drifts. My drifts take place not in the streets but in the distorted, glitchy and copywritten representation of urban life that is Google Street View. Unlike the flâneurs of 19th century Paris, I am neither a dandy nor a man of leisure. My drifts are an act of theft, of subversion and escape. I steal time back from a system that enslaves me to work for poverty wages in what has become one of the most expensive cities on Earth, London. Condemned to confining my body to the same two metres squared space day after day, repeating the same banal digital tasks. Repetitive data entry causes permanent strain in my right wrist and shoulder. My back is contorted, a continual source of discomfort. My mind is dull, a permanent haze of depression hangs thick throughout the office. This is not some personal affliction; it is a collective flattening of mood than can be sensed as you enter the four-digit security code that grants access. While you may initially attempt to protect yourself from the melancholy, it seeps into your very being. This is the emergent affect that arises from an open plan design within which openness and visibility are used as a form of discipline. Office workers have become adept at covering their mental wanderings. The shift from Facebook, online shopping or some other distraction to a work-related screen can be achieved by a keypress. My distraction, my escape, has become the digital drift.

Hand Job Under a Manchester Underpass

The first time I experienced Street View it registered as a shock. The type of shock that is rare for someone who has lived in a large city for a long time. Its arrival appeared with generalised anxiety. It initially awoke collective fears about privacy. Newspaper articles debated questions as banal as, could it be used by criminals to plan robberies? Can the cameras see into my house? Will I be caught in an embarrassing act like the famous examples of the people photographed leaving a sex shop, vomiting in the street, being arrested or being given a handjob under a Manchester underpass?

I was instantly captivated by Street View and its hyper-real parallel universe. I hoped the privacy lobby wouldn't turn Street View into a morally sanitised ideal representation of the streets. Street View would lose its seduction if the possibility of stumbling across the seedier sides of urban life were airbrushed away, the moral brigade finally getting to recreate the city as they would like it to be rather than how it is. Questions of morality and privacy seem to miss the fundamental essence of the shock. On experiencing Street View, I intuitively recognised a more fundamental process coming into being. Street View represented the first real attempt of the digital to breach its own boundaries. Mapping a territory is well known to be a prelude to colonisation, but no colonial power ever documented a territory to the level Google has mapped the physical world. Google Maps, Satellite imaging, GPS, and Street View combine to form an abstraction of the physical world. The would-be digital colonists of the physical have taken radical geography seriously. They have read de Certeau and paid attention to mapping both the totalising overview and the view from street level. Cartesian mapping is employed to enable social tagging.

Spectral Vision

Looking from the street you can see the small white flowers of the overgrown potato vine whose years of interlocking growth shelter the garden from the constant flow of traffic. Curious as to how much you can see inside the house I zoom, directing the focus on the downstairs window. Then stop. A strange physical sensation passes through my body in advance of any interpretation of what I have registered. The feeling is equivalent to being startled, but somehow different, a strange coldness that passes through the body but contains the prickly heat of irrational fear. I can make out the faint figure of a person in the grainy and pixelated image of the window, but not any of the people I expected. This is my own home yet the figure appears as a pale elderly reflection in the glass. A thousand cheap horror movie tricks have conditioned my response to this type of image. I recover from the initial recoil and study the image closer. The underlying compression algorithm is exposed by the magnification. The integrity of the image is at the point of impressionistic disintegration into geometric abstraction. I'm sure that the occultist Helena Blavatsky would have appreciated the geometric revelation thinly disguised behind the naturalistic representation of the world. I become aware of familiarity within the weak outline of the figure. A sensation I associate more with touch than sight. My conscious mind lags my body in its recognition, too distracted by irrationalism. Both the bodily sensations of knowing and my conscious thoughts start to coalesce into recognition. Feelings form into images only to form a name at the end of the process. This is Jenny, my partner's 91-year-old mother. Someone I know well but who seldom visits our house. A rare visit, a fleeting moment, has been captured and stands as a spectral representative for all the moments of this house.

Indelible Psychic Grooves

It is strange how, given the possibilities of endless exploration of the world, my first tendency is to visit the places I am already integrally tied. I do not explore unpronounceable towns in far off countries; I first head for my own home, my workplace and the routes that my repetitive daily routines demand I travel. I virtually follow the indelible psychic grooves I have already inscribed into the concrete of the city. Why follow these paths in digital space? Is it possible I desire to find evidence, proof of my existence? Is it the urge to witness myself from the anterior as others do but is always denied me? Is it the nostalgic urge to invoke past memories, reactivating them through the recollection of place? I am always drawn first to the spaces I currently inhabit, then to the spaces of my past, back to childhood and my teenage haunts. Aitkin Road, Meadow View, the Sung Ying Chinese takeaway and Robin Rix's shop, down Highthorne road to the train bridge which used to list all the scabs from the strike in thick white paint next to a hangman's noose, then along Glasshouse Road to what is left of Kilnhurst Colliery, over to Swinton Comprehensive School, the Patios Estate, down Goldensmithies Road, a visit to the infamous Denman Road and to the former site of Manvers Main, the pit where my granddad worked as a miner for most of his life and the sight of one of the ignition sparks of the 1984-85 miners' strike.

NEVER FORGET NEVER FORGIVE

My own most vivid memory of the 1984-85 miners' strike is being fourteen and hanging around with a bunch of mates, the usual reprobates, outside Robin Rix's corner shop, with its John Bull logo complete with Union Jack waistcoat emblazoned across the window. There were about ten or eleven of us varying in age from about 12 to 16, mainly boys, but with a few older girls. There was never much to do in Kilnhurst, so we would just hang about outside the shops hoping someone would come up with a Good Idea. Preferably that didn't involve glue or Briwax. David's older brother had just got taken to the hospital with some sort of glue residue in his lungs. That night Alan, whose Dad was on strike, had been given some homemade Nunchucks for his birthday and this lifted the boredom. The yellow light emanating from the Sung Ying takeaway seemed to make a perfect exotic location with its red plastic lanterns and stylised oriental writing in yellow and gold. Everyone was taking turns pretending to be Bruce Lee in Enter the Dragon. I was still waiting my turn when three police riot vans came at speed down the hill that leads past us and into the village, grills down and blue lights flashing. These were not local police, these were the MET and they did this sort of stuff just to intimidate the village, but tonight they came straight for us. Driving their vans up onto the pavement forming a semi-circle of blinding

bright lights. Half the group legged it behind Robin Rix's and down onto the railway banking to hide. I stayed, probably paralysed by fear, while Alan and some of the older kids started gobbing off.

PIG.

PIG.

PIG…SCUM.

The Police jumped out of their vans wearing helmets with visors covering their faces. It was the first time I had ever seen police look like this. They lined us up against the van, stole Alan's Nunchucks and threatened us, 'This village is now under a curfew. If we see any gatherings of more than six people after nine pm we are going to arrest them'. I have never found out if they had this power, I suspect they were lying, just another part of their psychological warfare against pit villages. Kilnhurst colliery was shut down not long after the strike. The pit wheel is half-buried in St Thomas's churchyard accompanied by a gravestone, but the epitaph most often recited in these villages is: NEVER FORGET NEVER FORGIVE.

Cinematic Return to the Point of Trauma.

My first experiments with digital drifting were solitary, escapist, acts of revenge. Stealing back time I was begrudgingly in the process of selling. Recent digital drifts have become collective, a form of research for a future Communism. The solitary drift encourages flights of fantasy or the internal embellishment of personal memories, a proactive form of nostalgia that allows us to rewrite our history in the manner that our present predicament would prefer. The collective drift is, as Guy Debord noted, more objective. It develops a dynamic of its own. Directions and points of interest emerge from the varied interests of the group. Aspects that would be missed in a solo drift are brought into relief.

As I drift the former Manvers Main complex, I'm situated in Hackney, Google Street View projected on a large screen. Friends drinking green bottles of Stella Artois and chatting, Robin Bale is rolling a cigarette, Laura Oldfield Ford is time travelling back to Denman Road circa 1993, Richard Barnbrook, the advocate of cybernetic communism, has brought his son Arty who is currently being indoctrinated into the cult of Minecraft, a cybernetic crash has been established as deep rumbles from Alistair McClymont's homemade bass cabs provide a soundtrack

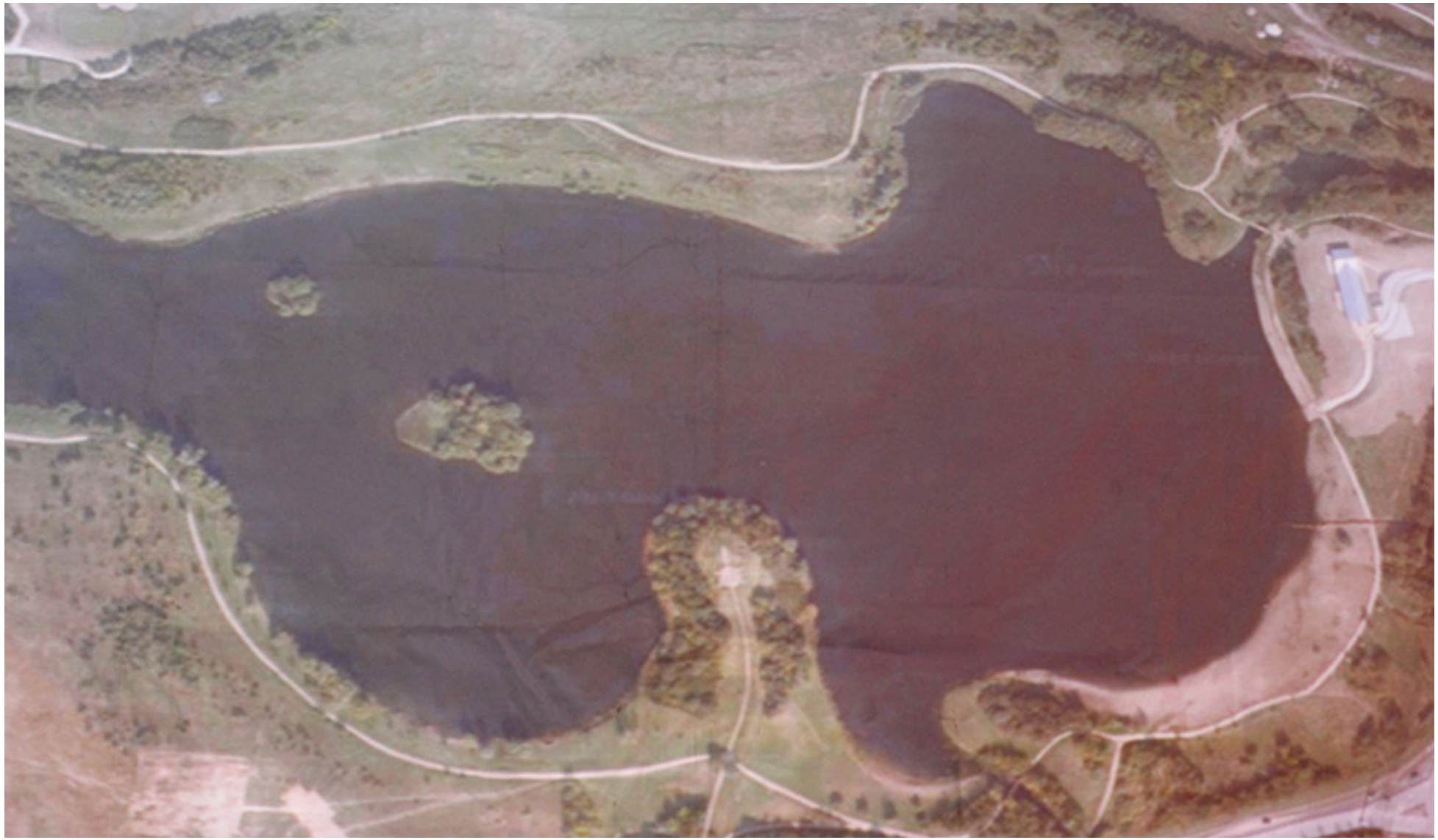
of vibrating glass window panes. We are in search of the Manvers Main complex. A complex of mines, linked underground that played a key role in the start of the 1984-5 strike. It was in Manvers's offices that George Hayes, the South Yorkshire NCB director informed NUM officials of the plan to close Cortonwood Colliery, triggering Yorkshire miners to walk out.

Manvers dominated the landscape. Its presence was insistent, with its huge spoil heaps fed by iron skips suspended from elevated cableways, fires burning in blackened coke ovens, overhead gantries and walkways, huge brick and steel buildings, railway sidings lined with full and empty coal trucks, its signature twin headgears that supported the hoists used to transport workers and materials in and out of the underground mine shafts. The weight and scale of the place dominated your vision but also stained the sky with a constant stream of noxious smoke from the towering chimney stacks.

Recently there's been a cinematic return to the point of trauma. Two recent films about the miners' strike are currently in the cinema, Pride and Still the Enemy Within. Our collective imagination cannot move beyond the strike. We repetitively return to this frozen moment, a psychological fissure that compels us to return in search a path to the future. But this path cannot be found through a return it must be formed through a REPEAT. Not a flaccid recreation, this remains a copy, further entrenching the trauma. A REPEAT enacts the intensities of the event in its present form, breaking the cycle of return forever.

SUPPORT THE ORGREAVE TRUTH AND JUSTICE CAMPAIGN.

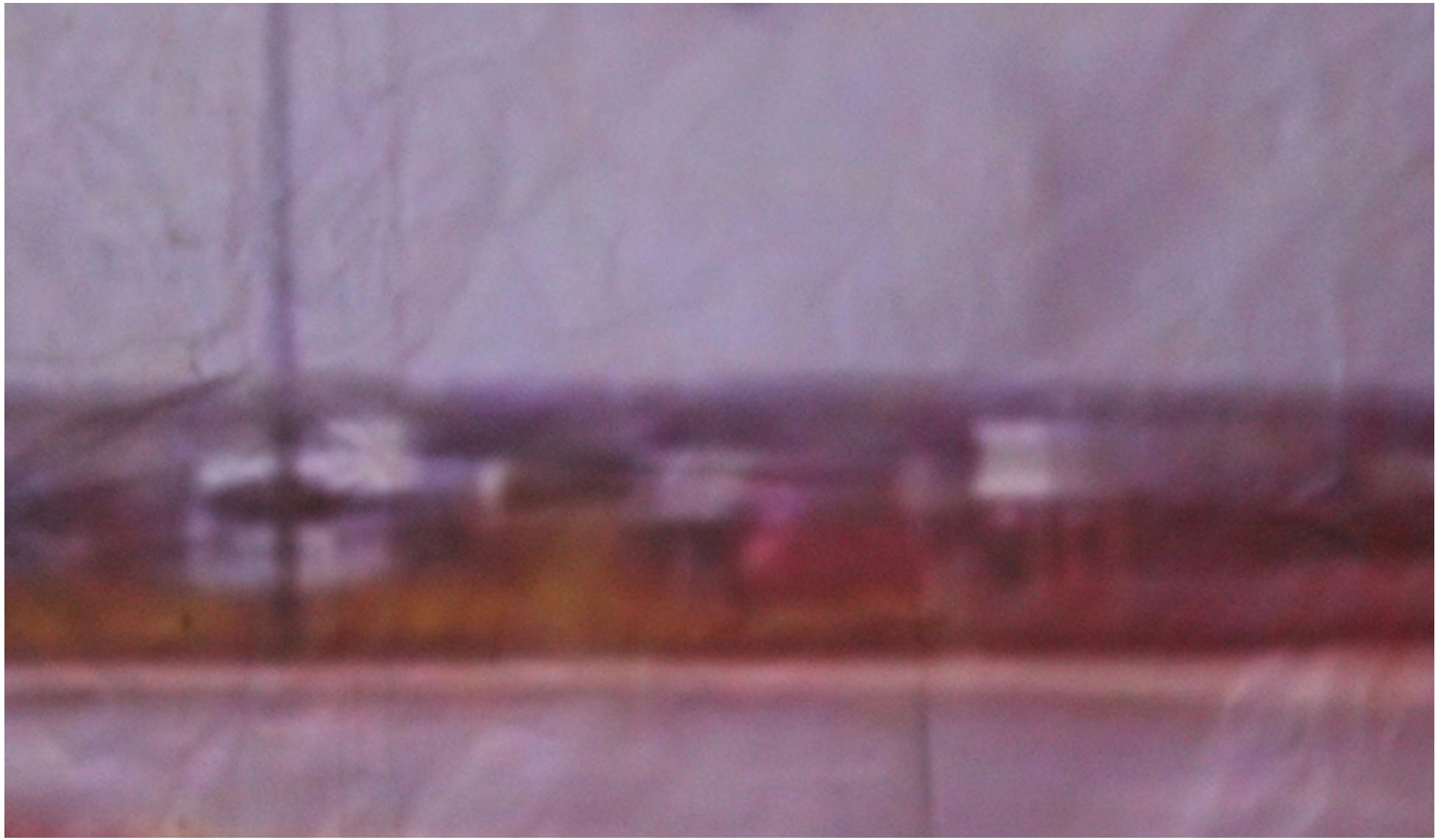
The Street View landscape being projected is at odds with the cinematic imagination. I do not know this place! It could be anywhere and nowhere. I track down the original location of one of Manvers twin headgears. One of the original pit wheels is half-buried in manicured grass. The site of the mine itself has been drowned, flooded and rebranded as Manvers lake. Street View has its limitations, our view is restricted to the roads, I switch to satellite view and look down on the whole area. A tonsil-like jetty of grass stretches into the deflated kidney-shaped lake with a path leading to what on first appearances looks like a crop circle. On finer magnification, this turns out to be some form of regeneration land art, a monument to the Town of Wath. From the surveilling eye of the satellite, we can trace scars in the landscape. A spectral map of former Manvers buildings made visible through disturbance in the vegetation. We are tracing the oblong scares on the earth, but our conversation is tracing alternative possibilities, alter histories and future routes. Manvers lake includes an RSPB reserve and was originally intended to be developed into a country park but has since been sold



off for development by TCN UK and is now branded as the Waterfront Development, a 285 acre private redevelopment that includes a boat club, Golf Course and is currently advertising plots for leisure, retail, residential and a range of office and industrial units. Conservation exploited as a method of increasing land values for private developers.

Denman Road

Concrete blocks mark out its absence. Oblong spaces of decaying tarmac surrounded by low crumbling red brick walls, car parking spaces stolen from the surrounding scrub grass, derelict concrete stairs that no longer lead anywhere, large stone boulders placed along the road to stop fly-tippers, these are the only reminders of the Denman Road Estate. A fitting legacy to the FUCKED generation who inhabited the now demolished flats that used to line Denman Road in the 1990s. The pits that made up the Manvers Main complex; Manvers Main, Wath Main, Kilnhurst Colliery, were all closed in 1988 only three years after the strike. By the end of the 80's the generations leaving school, my generation, had nothing, no prospect of a job, no hope and no future. Punk created an aesthetic around No Future; we had no choice! Stuck in the middle of nowhere, with all the anger of the miners' strike, hatred of the police, no workplace, no union organisation and no way out. The pressure cooker of long term unemployment and boredom, combined with drug and alcohol abuse, fused into an angry collectivist counter-culture and Denman Road was one of its centres. There were parallels between Denman Road and the large squatted streets in London such as Ellingfort Road and London Lane and there were influences from the traveller scene. Thatcher had used the same tactics against the convoys at the Battle of the Beanfield as she had against the miners, but there were also differences. The Denman Road scene was fiercely working class, no one could afford a converted bus to live in and why squat when you could still get a council flat? The hippy pacifism of the peace convoys was rejected in favour of a brand of uncompromising CLASS WAR, which manifested itself both locally in campaigns against a proposed toxic waste dump, keeping the far-right violently in check and nationally in the poll tax riot. The street had a constant stench of weed. Rumour had it that skunk was being grown under sodium lights by ex-miners in the old mine shafts. Walking down the street you were accompanied by a soundtrack that would shift from flat to flat, moving from hardcore techno, acid house, to anarcho-punk and dub.

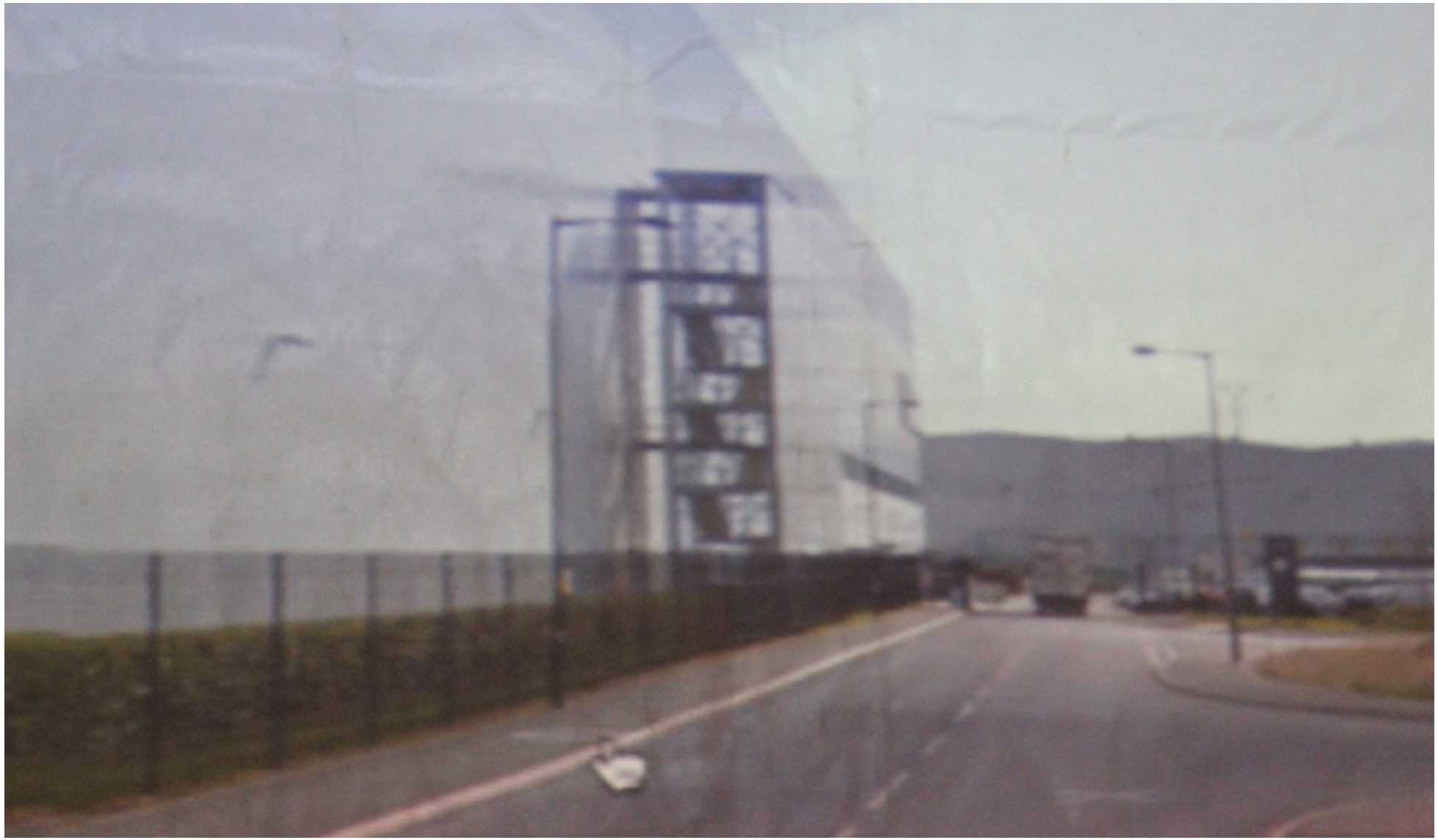


The Denman Estate became notorious for its drugs and lawlessness, but this is not enough to explain its complete disappearance. In many ways, Denman was just a prelude to the sacrificed estates that can be found all over England. What marked Denman out was cultural. A creative autodidactic culture existed here, kids who had been thrown out of school learned about politics through a practical DIY scavenger culture of making do and making it yourself. Denman was an autonomous zone and a signal of a nascent politics coming into being. Denman was the edge of civilization, the final strip of housing before you entered the post-apocalyptic poisoned wastelands that Manvers had become. In its 90's dereliction Manvers was an overpowering site, reports at the time suggested that the site was the largest area of contaminated and derelict land in Western Europe. The Denman Estate housed the children of this poisoned wasteland and in this marginal outpost, traditional social structures were being reconfigured. Tribalism was emerging, one that refused hierarchical structures but had its key figures, organisers, musicians, working-class intellectuals, gurus and dealers. It rejected consumerist festivals in favour of a cyclic calendar of annual sacred festivals and nomadic meeting points. It ridiculed religion whilst developing a materialist worship of the psilocybin mushroom, harvested annually from much-guarded sites. Time became cyclic. Progress meant nothing; you have to have a belief in a future to believe in progress. A cult of environmentalism was emerging and who could argue with those who had been suckled on the poisoned breath of Manvers Main's billowing smokestacks and abandoned to inherit their ruins. This was a savage community, but one with a strict morality. Testing on animals would be vehemently condemned, but dropping an acid tab in someone's drink would be a laugh. Informal communication structures emerged. Direct action to shut down the BNP's Welling bookshop was organised by leaving flyers for distribution with the main dealers, key nodes in the community's network. I felt for a while that capitalism might be undermined by an intensification of the counter structures of this emergent underclass. In retrospect, Denman Road represented the start of a wider shift in far-left politics, a retreat from economics and a turn towards culture. Readers of continental philosophy cite the defeat of the May 68 movement as a point of rupture, the shift from modernism to post-modernism, but this rupture was uneven and spatial. It takes a long time to dismantle a Nation's industrial base, the huge swathes of plant and machine that forged our landscape and the communities that had grown up alongside them could not easily be destroyed. It was only in the defeat of the Miners' Strike that the rupture finally fractured the industrial north. And it was those living in the edgelands who most intuitively felt this seismic quake that shattered both space and time.

Manvers Roundabout: Call Centres, Logistics and Education

We hit upon a massive structure, the sheer size of it could rival Manvers Main in its heyday. An enormous expanse of grey corrugated metal rises into the sky forming an acute angle as perspective sends our eyes hurtling forward along the immaculately straight Brookfields Way. This is an impressive blank, a minimalist vista of grey vertical lines broken by a perfectly angular green strip of manicured privet bushes and grass. Equally spaced floodlights only occasionally break the riveted lines that form its walls. There is no indication of what this immense place houses, why it is here, what its function is. Manvers Main was incapable of maintaining the separation between inside and outside, with its constant frenetic activity refusing to be bound and hidden, men and machines transported into and out of the earth, skips of slag and waste were drawn from below and exposed in man-made mountains, train carriages shifting materials to and fro, and that constant smoke. Manvers exposed its inner operations in a flamboyant display of exuberance, but this structure hides secrets. There are no traces of the workers, not even a fag packet dropped on the way to work. No one walks this pristine pavement. The inner operations, of this anonymous structure, are hidden from inquisitive eyes. Its huge expanse of zero visual stimuli is strangely enjoyable when contrasted with the usual constant bombardment of spectacular images. We continue down the street, mouse clicks and blurred renderings until we arrive at a high, yet open, black gate. Ahead we can see a car park and another identical corrugated grey structure, but we cannot proceed further. A large sign at the gates warns, 'Private Road Authorised Vehicles Only', another less significant sign contains the NEXT logo, this is the only clue provided to the purpose and operation of this vast secretive area with its full car park and two imposing buildings.

Heading back along Brookfields Way we pass another large corrugated structure, but this one is less shy. Mid blue and grey, running its full length are two stores of glass windows looking proudly out onto the street and shouldering a pair of oversized Maplin logos at each end. The drift continues; faceless corrugated structure after faceless corrugated structure. There is a uniformity that starts to render these imposing buildings invisible. A repetitive colour scheme of greys, light and mid blues desensitises you from their scale. LOGISTICS. This is the camouflaged STUFF of the falsely imagined immaterial economy. The hidden back end of so much consumer noise; billboards, radio and TV advertising, website banners, online shopping and the spectacular glass dome of the Meadowhall out of town shopping centre.



The mysterious secrecy has a purpose, blank concealment is important. Here the goods hidden inside these oversized warehouses remain just STUFF, mountains of STUFF, that hasn't yet been applied with the magic that will render them into admirable fetishes ready for consumption. There's a danger. In this gap between production and consumption, these large storages of goods can be seen for what they are. Simply STUFF. And questions may be asked as to why all this STUFF cannot just be taken and used.

Street View respects private property and drifting this territory exposes this as its blind spot. The distinction between public roads and private roads produces sudden unexpected invisible boundaries. We are repeatedly stranded at the entrance to a set of roads leading to buildings and structures we cannot reach. In map view we can see row after row of uniformly straight roads, each accessed via spokes radiating from a collection of central roundabouts, but our access to these zones are permanently barred. Sometimes there are visible boundaries, gates or barriers, but mostly just a simple road sign is all that is required to abruptly stop us in our tracks. This restricts our investigation of these sites but in doing so exposes the scale of privatisation of this former nationalised and publicly owned landscape.

White clad with an overhanging arched roof and two banks of green-tinted windows separated by a central column, this building stands out against its neighbours. This is one of the few buildings within the restricted zones that we can still clearly see from the street. A tall mast rises above it like a watchtower. Banks of communication equipment, circular dishes and long oblong white masts are clustered together by a triangular scaffold and suspended in the sky. The security is overt. CCTV cameras stand guard on raised poles at the entrance. A high mesh fence topped with razor wire surrounds the site. Some form of double security system is used at the entrance and a yellow sign warns, YOU ARE ON CCTV. Cameras are visibly mounted on each corner of the building and these are reinforced by heavy-duty round horn public address speakers. This building suffers from paranoia, but, unlike the secretive NEXT building, the workers here are visible. A bus shelter like structure has been provided at the rear of the building and it is rammed with smoking workers, litter collecting at the foot of the security fence behind them. As I zoom a strange glitch occurs. In a single movement, we time shift. A white blossom tree, previously barely noticeable, suddenly expands to obscure our view, sensing our presence the blossom is summoned into action to cloak the shelter with at least twelve months extra growth. Resting above the buildings central column is a corporate logo. Two overlapping squares, one yellow, one blue, intersect to create a third smaller green square, an angular representation of set theory. The logo is accompanied by the letters 'tsc' in some variation of the Times New Roman font. Tsc operates call centre services for corporate clients such as BT, Vodafone, Sky, EE and Sainsbury's. Tsc is owned by Webhelp and boasts that is has moved

beyond the call centre, also offering internet-based services such as social media monitoring and analysis. Tsc is one of several call centres, including Ventura and T-Mobile, who have set up operations at Manvers.

Another grey and mid blue corrugated structure, two stores of glass windows run its full length, identical to the Maplin building, except for a cheap printed vinyl sign, Garnett Dickinson Publishing. Parked at its entrance is a converted trailer. Glossy black paintwork with gold lettering that reads, 'Lenny's Hot Jacket Potatoes and Pasta' and is accompanied by a gold cartoon of a potato with arms and legs wearing a chef's hat. A serving window has been cut into the front and we can see a selection of bright sauce bottles on the counter. A man wearing a blue catering hat and tabard, probably Lenny, is leaning into a white van parked next to the trailer. There is something significant about Lenny's trailer. It stands out in this carefully ordered landscape. He has found a temporary gap in this development. A small space of land awaiting development and he has occupied it with the only accessible place to buy a hot drink and something to eat we have witnessed on the drift. He is an opportunist, parasitising this territory, but this trailer adds some warmth to the cold anonymous greys and blues that surround him. We are also finding gaps, ways to occupy the cold, static images presented by Street View. We have no ability to alter these images, no opportunity to change or intervene in them, but we occupy these images with stories, memories, speculative theories and discussions. Spaces we have only viewed on Street View become locations we know. Significant sites have emerged, inaccessible zones have become mysterious, vanished estates remembered and steps taken to move beyond the cinematic desire to return to the point of trauma.

MANVERS MAIN IS NO MORE.

6.2 Analysis

This chapter answers the research question: *What can psychogeography reveal about what happens to digital representations of space when they become part of the lived experience of space?*

This question is approached through the findings of 'The Manvers Main Complex', a performative event which experimentally extended psychogeography by making use of Google Maps. The usual psychogeographical walk was replaced with the colabrative navigation of a large projection of Google Maps. A group of around twenty-one participants met in a disused shop near Old Street in Hackney, London, to explore a completely different location, predominantly using Google Street View, but also utilising other aspects of Google maps. I will refer to this event as the Manvers Digital Drift.

Google Maps is a digital mapping service developed by Google which provides an integrated suite of mapping services, which include street maps, 360° panoramic views of streets and satellite imagery. At the time of the drift, Google Maps had become the most widely used mobile phone app in the world. In the 2013 GlobalWebIndex survey, Google Maps were revealed as the most popular mobile app, used by 54 per cent of the global smartphone population.

The purpose of the research is to get a better insight into how Google's digital representations influence understandings of space. As with the other drifts presented within this thesis, the Manvers Digital Drift does not use Google Maps in an everyday way. The performative event was designed to focus the participants' attention on Google's representational strategies, its affect and aesthetics and the discourse it inspires. My approach to the research question is twofold. It contrasts a critical analysis of Google's digital representation, rooted in critical cartography, with the empirical experience of the Manvers Digital Drift. The research takes place within a wider academic debate around representation and non-representational approaches to understanding spatiality. Non-representational theory calls for a movement away from a focus on the interpretation of representational meaning toward a consideration of what representations do in the unfolding of the social world. This debate is of prime interest to researchers interested in ubiquitous and mobile computing and digital cities in general because, 'Digital technologies are fundamentally representational – the basic stuff of computer programs is representations – and since ubicomp technologies focus especially on representations of the objects and activities of everyday life, the representational practice at work is consequential' (Dourish, 2011, p. 195). Digital representations play an active role in

how the space of everyday life is produced. This is especially true of Google Maps, which provide a framework through which space is understood and used.

The research question raises two related concerns: 1) What representational strategies do Google Maps employ to convey spatial meaning? 2) What understandings of space do Google's representational strategies inspire through their use?

The most established academic approach to understanding spatial representation is critical cartography which, whilst rooted in the science of geography, has been extended to analyse geographic information systems (GIS). Critical cartography is concerned with the role spatial images and representation play in forming and communicating spatial knowledge. (Burgess, 1990; Cosgrove, 1984; Cosgrove and Daniels, 1989; Jackson, 1989). Critical cartography uses the tools of critical theory and the careful interpretation and analysis of cultural objects such as maps, but also the spatial representations found in literature and art. It is concerned with understanding the meanings, values, ideas, and feelings inscribed through representation. It is particularly interested in the social identities and relations that representations assume. It asks critical questions such as who, where, and what is represented and who, where, and what is excluded from representation. Critical cartography is also interested in the form of representation: how is it produced, and with what effects? Critical cartography was extended throughout the '90s and early '00s to analyse geographic information systems and the emerging geographies of digital technology (Bingham et al., 1999; Crang et al., 1999; Graham and Marvin, 2001; Holloway et al., 2000; Kitchin, 1998). The hegemony of critical cartography has been challenged by non-representational theory (Thrift, 2000; Thrift, 2007) and more-than-representational theory (Lorimer, 2005) which has sought to reorientate geographic analyses beyond a perceived overemphasis on representation (in a variety of forms), and a form of representationalism (whereby meaning is something formed in the mind and that acts as a precondition for action), toward an emphasis on practice, embodiment, materiality, and process (Simpson, 2017). This shifts the debate away from the analysis of spatial representation and towards embodied experience and spatial practices. The central question here is to what extent digital representations inscribe spatial understanding. What role should we ascribe to digital spatial representation in understanding the production of space?

The structure of this chapter brings critical cartography and non-representational approaches into friction through the findings of the Manvers Digital Drift. Contemporary discourse within critical cartography is used to critique Google Maps. This is then contrasted with the experience of both participating in the Manvers Digital Drift and producing the performance

writing (See Practice Insert 3). The conflicting approaches to understanding Google's digital representation are brought together and used as tools to move beyond the representation/non-representation binary.

Figure 10- 3.5-metre wide projection of Google Street View.

The Manvers Main Complex was staged as part of the Edge of Human project, an exhibition and programme of performance events, curated by Lucy Woodhouse and organised by the French Riviera Gallery. The event was staged from 4pm to 5:30pm on Sunday 16th November 2014 at 70 Paul Street, Hackney, London. The drift had a core participation of nine people. However, throughout the event a further twenty-one people attended and participated. The digital drift consisted of a projection of Google Street View onto a large, approximately 3.5-metre wide projection screen. The Street View images were navigated via mouse clicks using a wireless mouse. The drift focused on the Manvers area of Wath upon Dearne, South Yorkshire. The area's current land usage and architecture were explored using Street View. Occasionally Satellite View and Map View were also used to get a better understanding of the area. Throughout the event the participants were drinking alcohol and directing the drift, suggesting streets to follow and discussing things of interest as they arose. The participation was transitory, and people would move between active engagement, standing outside the gallery, smoking cigarettes or breaking into smaller groups and carrying out private conversations, sometimes inspired by the drift, the politics of the area past and present, and sometimes totally unrelated concerns. There was a core group of around nine

who actively participated throughout. Most of these had attended previous events I have organised. There was a secondary group, who participated as spectators.

Street View's initial starting point was the Manvers roundabout, Wath-upon-Dearne, Rotherham, South Yorkshire, GPS location N 53 30.124 W 1 19.041. This location has deep emotional resonance for me personally. It is the site of my childhood, my grandfather's former workplace, and my mother's final workplace before her retirement. The location was selected after observing the use of Google Maps by office workers, who used it to communicate with each other something of their childhood or the places they had previously lived in, overlaying the banal Street View images with their own personal stories. Personal and collective memory had played a significant role in the experience of the Hackney Drift, and the Manvers area is overladen with collective meaning and spatial transformation. Manvers was a former area of heavy industry dominated by the Manvers Main colliery complex. This was a network of coal mines, linked underground, that included Manvers Main, Wath Main and Kilnhurst collieries. Manvers played a key role at the start of the 1984-5 miners' strike. It was in Manvers's offices that George Hayes, the South Yorkshire director of the National Coal Board (NCB) informed National Union of Mineworkers (NUM) officials of the plan to close Cortonwood Colliery, prompting Yorkshire miners to walk out. The Manvers Main complex was closed on 25 March 1988. Between 1988 and the late 1990s the area was left derelict and formed the largest area of contaminated land in Western Europe. Through a regional regeneration programme, funded partly by the European Social Fund, the Manvers Main complex was demolished and the area landscaped and redeveloped as an area of light industry, housing call centres, logistics firms and several very large warehousing and distribution centres, most notably NEXT and Maplin Electronics.

The analysis is divided into two subsections. The first section looks at the critical cartography of Google Maps. It uses critical cartography to deconstruct and analyse Google Maps' digital representation of the Manvers area. The second section explores Google's digital representation of Manvers and the spatial imagination it produced within the context of the digital drift.

This chapter opened with a series of vignettes of performance writing (See Practice Insert 3) produced in response to the digital drift. The writing was personal, yet drew on the collective storytelling experience during the drift. The performance writing is an expression of my subjective spatial imaginary that emerged through reflection on the experience of the Manvers Digital Drift. In this chapter I attempt to break down the divide between performance writing and the analytical content by maintaining elements of the performance writing style.

6.2.1 Google Maps' Digital Representations of Manvers

Remote Viewing – 'Subtly, subtly they became invisible'

The drift is an opening up to the subtleties of a terrain, an opening of awareness of the flows and structures of power embedded physically, symbolically and psychologically within the terrain and the social practices that constitute it. It is a form of traversing that allows the subconscious sense that guides us through conventions, invisible borders, intentions, and the subtle practices of social order and disorder to become part of the subject of the drift. Space cannot be read, in the conventional sense, with the dominance of the visual, the decoding of words and sentences that form a text; space is experienced simultaneously by all the sensors and presents itself as a collection of intensities, as intuition. The symbolism inscribed in the landscape is too multifarious to be coherent. The signs of power do not dominate behaviour, but may suggest it; behaviour is constructed through a series of micro interactions, yet these intuitive micro interactions signify the expectations and transgressions, the norms and anomalies, of a location.

The Manvers Main Digital Drift explored the Manvers area of south Yorkshire through a form of remote viewing, through the psychic travelling from one place to another via the medium of Google Maps. Google Maps, a simulacrum and representation of space, was the intuitive platform through which to approach Manvers, itself more of a symbolic representation that an actual lived space, a copy of a copy of a hundred other similar spaces, with only the slightest of local variation: a space whose existence has developed in tandem with the communications infrastructure that enables Google Maps and which was born in the transformation of Manvers from the site of a national industry into a node in the global flows of goods and communications. Call centres and goods depots mask the polluted soil with huge corrugated aluminium warehouses dedicated to the logistics of globalised production distribution and control. But what of Google Maps, the medium that allowed our drift to transgress its physical situatedness, even if only partially? Can we ignore its specificity? Can we ignore its watermarked copyright inserted into every image, every screenshot? Can we treat Google Maps as a neutral space that we can simply employ as a tool in our remote viewing? Can we treat it as a value-free platform, a scientific rendering, for our unquestioning psychic occupation? Or does Google Maps construct our understanding? And if so, what subtle techniques and what subtle messages does it insert into our reading of a space? To what level can we establish Google Street View as a valid terrain for a digitally expanded psychogeographical drift? And what does the psychogeographical drift bring to our understanding of Google Maps?

Understanding the structures of power within the landscape is an essential part of a conventional drift, the fluctuating ambiences that afford certain expectations and behaviours, symbolic signs translated through practices, that define what and who is acceptable. Within a digital drift, using Google Maps, the terrain is entirely simulated and symbolic, a secondary constructed signifier of the actual space. A drift through the terrain of Google Maps is a drift through the Situationist spectacle itself, and the digital psychogeographer must pay equal attention to the subject of the remote viewing and the terrain of the map as a constructed platform. Google Maps is not a space in the conventional sense. It is a graphical representation of space. And here the dominance of the visual and the significance of the constructed sign and its hidden signification have a heightened relevance. The psychogeographer must be attentive to the hidden traps, the misleading signifiers, the subtle technologies of power and the invisible transformative effect Google Maps exerts over the spaces it represents.

We situated our drift in the projected images of Google Maps to learn more about this complex tool; we drift through its representations, occupying its images with emotion, memory and mythologised stories whist simultaneously subjecting it to sober logic and analysis. We seek to more fully understand Google Maps as an expanding tool in the global production of space, in the production of a global space. The transformation of Manvers can only be understood as a local transformation within the context of a wider global transformation, which Google Maps does not just represent but is implicated in constructing.

Google Maps

Never before has a mapping technology had such a global reach, or has been embraced so deeply into the everyday life and practices of the global population. Advanced digital mapping and navigational technologies, previously the preserve of specialists, are now accessible to anyone capable of running Google Maps on a cheap smartphone or tablet. Google Maps has become the most widely used mobile phone app in the world. Google Maps' market saturation has reached a point that challenges dedicated satellite navigation devices, as observed by the UK's Office for National Statistics: 'A number of items have been removed in 2015 to make space for new additions. In some cases, this reflects low or decreasing expenditure, such as on satellite navigation devices where smartphone applications are increasingly being used for navigation […]' (Gooding, 2015). The mapping tools provided by Google Maps are now deeply embedded in people's everyday understanding of

the world, the way they locate themselves and navigate and conceptualise the world around them.

The generalised perception of Google Maps is that they present a neutral and scientific mapping of the geospatial terrain, providing an overview, simplifying and aiding navigation between A and B. Google Maps are viewed as neutral, as simply interpreting and telling the truth about the world, a rendering of the earth's topology as visible, understandable and navigable. Its practical utility signifies its honesty in representing the world, and Google Maps' cartography has been provided with further scientific legitimacy by the addition of supporting photographic evidence, in the form of both satellite imagery and the photographic view from the street. The Google Maps suite of programmes allows a location to be viewed either as a conventional map, from above using Satellite View or from the perspective of the street using Street View, and it provides a number of detailed combinations of these views, each reinforcing the accuracy of the other. Google Maps' key claim to neutrality and legitimacy is that it has simply engaged in the accumulation, collation and representation of knowledge about the world. Its maps, from this viewpoint, represent a positivist scientific rendering of knowledge.

While Google Maps rapidly extends the role of mapping deeper and deeper into popular and everyday use and its neutrality is taken at face value, the Manvers Main Digital Drift was more suspicious. Centred as we were in front of a large projection screen, analysing Manvers, locating its vanished sites in Map View, traversing its streets frame by frame in Street View and zooming in to observe traces of the former mine in the growth patterns of vegetation from images provided by earth-orbiting satellites, the over-used Foucauldian metaphor of the panoptical could not be avoided. But from our analytical observations, our drunken nostalgic reminiscing, we were not the watched, the prisoners. We were the voyeurs, the overseers, the prison guards. Our drift, located as it was in a disused retail space in Shoreditch, became the techno central command centre, a virtual observation tower and our voyeuristic position objectifies. It inevitably produced the other, the 'them' the observed and the 'us' the observers. The power of the tool to objectify is inescapable, producing its own giddy pleasures whilst hinting at wider power structures at play within the Google Maps suite. Since the 1980s critical cartographers and geographers have established the roles played by mapping and mapping practices in the domination of territories and their populations (Harley, 1988; Wood, 1992; Monmonier, 1996; Pickles, 2004; Dodge and Kitchin, 2000) and Google Maps do not escape these critiques. The experience of the Manvers Main Digital Drift suggests that Google Maps extends these concerns, representing a mutation of the world of maps into a complex multifaceted ideological apparatus and practical tool for power,

surveillance, and control. In *Discipline and punish*, Foucault writes that

> we should abandon a whole tradition that allows us to imagine that knowledge can exist only where the power relations are suspended and that knowledge can develop only outside its injunctions, its demands and its interests [. . .] We should admit rather that power produces knowledge (and not simply by encouraging it because it serves power or by applying it because it is useful); that power and knowledge directly imply one another. (Foucault, 1995, p. 27)

From this perspective, Google Maps' claim to scientific neutrality in the gathering and presentation of geospatial knowledge is thrown into question. Google Maps appears as a suite of tools through which a will to knowledge about the world conceals and is produced by a corporate will to power. By corporate will to power I am not suggesting some form of conspiracy, or even a concrete and coherent strategy of dominance by Google, but an underlying driving force that manifests itself creatively and concretely through Google's products, disseminated globally by the most widely used digital map in the world. The presentation of knowledge obscures underlying power relationships that are opaque to the general user navigating a town or a city.

The Google Maps suite provides multiple views constructed from multiple representational technologies; it embodies the use of satellite technology, employing both satellite imaging and the satellite-based Global Positioning System (GPS), car-mounted surveillance equipment and advanced mapping techniques. The Google Maps suite utilises four key approaches to mapping space: 1) traditional Cartesian mapping 2) Satellite imaging 3) Street View's photographic panoramas. 4) The use of GPS coordinates to grid and cross-reference each view. Each of these techniques of presenting knowledge exerts subtle, invisible forms of power.

Map View – 'Corporate Constellations'

We switch from Street View to Map View, surveying the network of streets that make up Manvers. We are in search of Denman Road, or more specifically the flats where Laura Grace Ford stayed, at some point between 1993 and 1994. Laura was present at the drift and directed our search. The street names look familiar, but none of the significant local landmarks that would give us orientation are listed on the map. And despite the fact that Manvers is a location with such a deep historic connection to the mining industry, and was one of the key sites that sparked one of the most significant industrial disputes in British

history, the 1984-5 miners' strike, none of this has made a mark on Google's mapping of the area. Even the pit wheels, half-buried in the ground to make a symbolic connection between the area's industrial past and the present, or the monument to the town of Wath, are absent from the map. What is perhaps most significant about this particularly unusual area of land is the absence of retail outlets; this is reclaimed wasteland pitted with warehouses and light industry, surrounded by the small villages of Wath upon Dearne, Brampton and Bolton upon Dearne. Yet the most significant landmark dominating Google Maps' rendering is a constellation of circular icons, standing out above the background cartography like the stars of Cassiopeia against a cloudless night sky. What are these iconic locations, provided to help us orient ourselves within this transformed landscape, more dominant than any of the significant local landmarks and given special cartographic emphasis by Google Maps? A white circle containing a red knife and fork accompanied by bold red text helping it stand out from the surrounding street names and taking up an area on the map equivalent to Manvers lake; the text reads '**SUBWAY –** Build-your-own sandwich chain'. Strangely, Subway is situated in a network of streets not accessible from Street View, and from Satellite View it appears as a building site. Subway is just one icon that jumps out from the cluster scattered over the map. We explore this constellation, moving from one white circular icon to the next. There is a white circle containing a blue shopping trolley icon: the associated text reads 'Tesco'. The next, containing a brown bed, is accompanied by the title 'Holiday Inn Express Rotherham – North'; Another white circle, this time containing an orangey-red cup and saucer with the title 'Costa Coffee', and another red knife and fork icon, this time accompanied by the abbreviation 'KFC'. These are the significant sites Google Maps inscribe into the Manvers landscape: two global food chains, a multinational coffee shop, a multinational supermarket chain and the location of the Rotherham North branch of a multinational brand of hotels. Google Maps has nothing to say about the area's local and historical landmarks. Manvers' monumental pit wheels are absent from its cartography, and the key landmarks provided to orient this landscape are all multinational chains.

Google's digital cartography used in the production of Map View does not escape the critiques of power and knowledge applied to traditional forms of cartography. Google Map View must be seen in the light of J. B. Harley's 1988 observation that 'Whether a map is produced under the banner of cartographic science – as most official maps have been – or whether it is an overt propaganda exercise, it cannot escape involvement in the processes by which power is deployed' (Harley, 1988, p. 279). Google Maps' power is obfuscated by its acceptance as a purely scientific neutral interpretation of the physical environment. However, all maps 'lie' (Monmonier, 1996) as a result of the choices made by those who commission and construct them. Maps, by necessity, have to simplify the complexity of an environment,

and in doing so they tell selected truths. ‘A single map is but one of an indefinitely large number of maps that might be produced for the same situation or from the same data’ (Monmonier, 1996). To portray meaningful information about the complex three-dimensional world on the flat screen of a mobile phone or computer screen, Google Maps must distort that information, and in doing so it embeds, either consciously or unconsciously, a set of assumptions. It introduces bias (ethnic, gender, political) and sometimes conscious propaganda (advertising, national, corporate agendas). To be effective, Google Maps has to maintain the appearance of scientific neutrality. Its stories have to be believable. All maps carry subliminal messages about their authors, sponsors, or publishers, and Google is particularly aware of how to present a corporate identity and how to embed and reinforce this within its design. What is perhaps most striking about Google Maps is the decision to emphasise bars, restaurants, banks, coffee shops, hotels and other multinational commercial entities over significant local sites within the landscape. Google Maps is provided free to use on a desktop or as an app to download onto a phone or tablet. Providing such a powerful navigation tool for free accounts in part for its success. But Google is not benevolent, and Google Maps is part of a wider corporate strategy to provide free technological tools in order to generate advertising income.

AdWords, Google's online advertising programme, is fully integrated into Google Maps. As Google themselves explain, ‘Google Maps shows search ads in two places: within info cards beneath the search box and on the map. On-map ads appear with a yellow “Ad” icon and text from your search ad’. An algorithm pairs your search with likely Ad matches. The Ads are then placed directly onto the map with a yellow circular Ad icon; they also appear in the map’s search box. Google generates income from advertisements on a cost-per-click basis. Google Maps’ cartography uses layering and secondary clickable information, which contributes to the subtlety of Google’s bias. A clearly defined outline of a space’s topology, including building sizes and shapes, are presented as a base background map using gentle, washed-out colours. This base map provides an extremely detailed rendering of the physical space it represents, and it embodies both in its detail and graphic design the aura of scientific truth. The base map is overlaid with stronger infographics, clickable icons that provide further information. Infographics are responsive to specific search criteria: therefore the rendering of a particular location will be dependent on the search keywords used to arrive at the location. To return to Monmonier’s (1996) claim that all maps ‘lie’, Google tells many different lies to many different people. It is a selective and personalised liar. But it also has a more generalised bias. Its cartographic emphasis towards business interests – restaurants, bars, banks and multinational corporate players generally, provide a very particular, political and cultural rendering of space. The pretence of neutrality and scientific objectivity belies a

corporate agenda: a corporate will to power that constructs a very particular landscape. The landscape Google constructs is a landscape symbolically dominated by multinational commodity capitalism. This embeds a digital logic with the power to influence how the space is used.

Street View – 'Lusting after the blurry-faced redhead'

Like a mirror, Street View is an unreal space that opens up behind the surface of the screen, or projection. A window is presented into an alternative world. But there is a key and fundamental difference between the world in the mirror and that of Street View. In the shadow space of the mirror you are presented with the image of yourself (Foucault, 1984). In Street View the image of the self is absent. You are denied the anchor point of the reflected gaze of the self and are denied its power to root and confirm your own presence that would allow you to be reconstituted back within physical space. The gaze of the viewer is allowed to drift unimpeded into the horizon of the image. It enters the imaginary plane of the projected simulated space of Street View. The body remains rooted and situated, a nagging reminder of our physicality, but the imagination is well trained in selectively filtering off the senses, at least until you need a cigarette, to use the toilet or get another beer, or some other distraction takes hold. The imagination is allowed to transgress its physical bounds, to psychically travel and occupy the simulated space, to engage in techno-mediated remote viewing, but the prosthetic optic of the projected image cannot be severed from the optic nerve housed in its fleshy body. The imagination is freed to occupy Street View's simulated terrain through the telling of stories, the invoking of memories, allowing itself to be led by observations and construct speculative narratives. However, what I wish to focus on here is a darker and more politically suspect aspect of our digital drifting. Power is inescapable, and with the power of the voyeur comes a perverse intoxicating pleasure. Within the drift there was a moment, a small point of rupture, exposing one of the problematic effects of Street View. The Manvers area, as represented by Street View, is significant for its absence of people, but the drift revealed an image of a couple walking along Manvers Way. The unusual presence of people in this landscape attracted the attention of the now inebriated drift. A female member of the drift alluded to the fashion choices of the female member of the couple. Dyed bright red hair, a blue patterned white smock dress over black leggings and a pair of black suede Ugg boots. The blurred faces of Street View's residents could never reciprocate or offer resistance to their unseen observers. Street View liberates 'our' gaze, and 'their' bodies become fragmented and objectified for 'our' pleasure. It produces the power to see and not to be seen. We zoomed in closer and the couple became objects, persuaded and consumed from the

safety of our virtual observation tower. We surveilled them, and in doing so we constructed them as surveillance subjects.

Street View's formal qualities create surveillance subjects. Not necessarily surveillance by the police or the state, but surveillance by its unseen users. This oblique form of power may have fundamental implications for the actual streets that Street View represents, suggesting Street View's assimilation into the wider society of discipline and control. A good illustration of the danger of the construction, by Street View, of surveillance subjects, particularly by the libidinal gaze, is the emergence of websites such as doxyspotting.com which trawl the Internet documenting images of suspected prostitutes. Its 'About' page states: 'This website gathers international Street View sightings of prostitutes, brothels pick-up spots and red light districts'[22] While doxyspotting.com presents itself as an amoral voyeuristic venture, its careful mapping of prostitution hotspots and its documenting of locations, street names and images of prostitutes, including illegal acts such as the prostitute documented in the process of giving a hand job to a client under a Manchester underpass,[23] suggests the potential to create moral pressures that could ultimately lead to police harassment and the arrest of those featured on the site, pushing prostitution into less visible, and by definition less safe, spaces. Street View's simulation of space, through the process of making visible, contains the potential to transform the actual streets and affect the lives of those who use them. By shining a spotlight on to the streets' liminal spaces, by making them visible, legible and knowable, Street View offers the potential to play an indirect role in the policing and subsequent taming of the real physical streets it represents; to become a distributed form of surveillance, ultimately serving the forces of power and control in their varied and local contexts.

Satellite View – 'Icarus over Manvers Lake' (After Denis E. Cosgrove)

We took vertiginous pleasure in our flight above the waters of Manvers Lake, remote sensing, searching for the past, present and future. But we flew our remote-control Icarus too close to the always intense Google sun, and his beautiful white feathers fell from his wings and his skin, scorched, became ashen grey. Our simulated angel transfigured into the terrifying sight of the reaper drone.

Google's Satellite View, of all the representations presented by the Google Maps suite, is perhaps the most overtly innocent and the most overtly threatening. The Satellite View of Manvers provides a very detailed overview of the area. Its land use is visible: ploughed fields,

[22]Doxy Spotting, available at: http://doxyspotting.com/about/ [accessed 11/3/2015]
[23]Doxy Spotting, available at: http://doxyspotting.com/public-handjob-streetview/ [accessed 11/3/2015]

waste land, new construction sites, flooded wetlands along the river Dearne and the outlines of the surrounding villages. Zooming in, fine detail can be observed. On Manvers Lake ducks are swimming together in formation, and an artificial crop circle is visible at the end of a tonsil-shaped jetty of grass; traces of some of the former mine buildings reveal themselves scorched into the earth, goods stacked on pallets expose the enormity of the NEXT depot, cars cluster together forming ordered patterns and small relics of Denman Road's former housing estate can be tracked down in the coarse scrubland. Where the cartography of Google Maps may be questioned, Satellite View presents detailed photographic evidence. Elongated shadows of shoppers pushing trolleys in Tesco's car park testify to the detailed accuracy of the Satellite View rendering. Google Maps' perceived impartiality is essential to the continued reading of Google Maps' neutrality, and the addition of satellite images symbolises this impartiality by furnishing it with the quality of cold scientific evidence. A photograph taken from above a terrain has a different reading to that of a cartographic representation of the same terrain.

People have become attuned to the constructed image; they know the camera lies, the airbrushed images of models on billboards and the covers of magazines have taught this lesson. Digital photography is everywhere, embedded into every smartphone, and the techniques of manipulation are common knowledge, but the technological nature of the satellite image provides some distance between the very human tricks of manipulation and the evidence presented by the Satellite View's technological aerial photography. The further the image production is removed from the human hand the more it signifies objectivity, and the lens of a satellite-mounted camera orbiting the earth at an altitude of 617km[24] signifies that these images reveal a fundamental truth. 'Satellite images, like any mechanically produced image, bear the legacy of positivist narrative that assumes that scientifically produced imagery provides the most unobstructed and bias-free window on the "real world"'. (Harris, 2006) Satellite images are rich in topological detail and provide supporting evidence of Google Maps' accuracy and scientific neutrality. Their perspective rises above the subjective to reveal objective knowledge. Satellite photography symbolises the truth: it claims not to lie in the same way cartography must lie.

Looking down on the Manvers roundabout, with its striking spiral landscaped verge, the image is layered, a satellite photograph overlaid with cartographic detail. Satellite View presents a mixed representation of the landscape from above. The satellite imagery is

[24] This is the expected operating altitude of DigitalGlobe's Worldview-3 Satellite as stated in the satellite's datasheet. Available at: http://www.spaceimagingme.com/downloads/sensors/datasheets/DG_WorldView3_DS_2014.pdf [Accessed 17 May 2015]

enhanced with cartographic details, maintaining a stylistic continuity with Map View. As you switch from Map View to Satellite View the graphic representation of the roads and the street names remain in place. In Map View's graphical representation the road is transformed into a translucent grey route suspended above the tarmac of the Satellite View's photographic image, hovering at a height just above the treetops: cars, partially obscured, are visible, frozen below it. The textual street names remain in place, but as you move from Map View to Satellite View, the black Arial font is treated with a textual effect: the font is changed from black to white, taking on a black outer glow that allows it to levitate above the photographic road and hang suspended on the raised grey graphic platform. Zooming out, other cartographic information hovers over the satellite's image. Google's square blue icons representing bus stops become visible at regular intervals along Manvers Way and Station Road. The constellation of Manvers's key landmarks, Tesco, Subway, KFC, Costa Coffee, etc., continues to be highlighted, glowing above the greens and greys of the satellite's photographic landscape. The effect of aerial photography is to reinforce the neutrality of Google Maps: the mechanical distance of the satellite aerial view signifies factual information, and this reinforces the neutrality of Google's cartographic choices. It obscures the bias inherent in the emphasis given to multinational business within the Manvers landscape.

Zooming out further, the detail disappears; each magnification, as it decreases, reveals different levels of detail: different formations and patterns in the landscape emerge as others retreat, each level containing its own form and its own content; small details become generalisations, individual cars disappear as roads become an interconnected system, minor roads vanish as motorways form networks cutting through a patchwork of greens, yellows and browns. Cities and their interconnections become readable – Rotherham, Barnsley, Doncaster, Sheffield, Leeds – but where are the clouds? A cloudless sky over the whole of South Yorkshire is a freak weather occurrence. Decreasing the magnification further reveals the outline of the British Isles set against a deep blue sea, a detailed outline of the seabed, peaks and troughs forming a complex submerged terrain, an inconceivable natural phenomenon rendered legible alongside a strong white graphic border demarcating Northern Ireland from the rest of Ireland, the naturalism of satellite view's seabed terrain reinforcing the 'naturalism' of a deeply contested political boundary. Zooming out beyond this reveals Satellite View's representation of the whole earth, rendered using a variation of the familiar and heavy critiqued Mercator projection. Machiraju has noted that 'the Mercator projection is a poor choice for maps of the globe in its entirety or for large landmasses on digital displays. The higher latitudes suffer from undue distortion and convey a false sense of proximity to the user, while the polar latitudes are completely missing […]' (Machiraju, 2014). The projection

has also been the subject of ideological criticism. In Monmonier's account of the controversies surrounding the Mercator projection he points out that the '[…] rhetorical prowess, rooted at least as much in the map's symbols and generalisations as in its projection, makes the map vulnerable to diverse ideological interpretations. Thus the Mercator map can be viewed as an icon for Western imperialism […]'(Monmonier, 2004). I do not want to venture into the arguments around the Mercator projection here.[25] Its relevance to the Manvers Digital Drift is that it raises some questions about the actual honesty of Satellite View, as does the eerie lack of cloud coverage, not just over South Yorkshire, but over the whole of the UK and Ireland: in fact there is no cloud coverage over the entire planet. Zooming back from 2000km above the Manvers roundabout, the copyright information at the bottom right of the map tells its own story. From 2000km to a height of 1km the images are copyrighted by TerraMetrics. The TerraMetrics website boasts 'the first cloud-free global Earth image based on actual land cover colouring'[26]. In effect these images are not satellite images at all, they are a 'visual portrayal of our planet', i.e., a graphical representation of the land mass using naturalised colours and utilising a distorted and ideologically suspect projection. Below 1km the images are copyrighted by DigitalGlobe. DigitalGlobe supplies Google with actual satellite images, but the lack of clouds within DigitalGlobe's satellite images suggests that these images are composite images constructed to eradicate the visually disruptive effects of cloud coverage. Rather than being examples of spontaneous aerial photography representing scientific indifference, these satellite images have been subjected to a high level of digital manipulation. They are constructed composite views of the Earth. Below 10m the images of the Manvers roundabout are copyrighted by Infoterra Ltd and Bluesky. Infoterra Ltd and Bluesky are companies that supply aerial photography of the UK and Ireland. What this copyright narrative reveals is that Satellite View is not actually the view of the ground from satellites orbiting the Earth, as its name suggests. It is a complex constructed montage that seamlessly integrates images from a variety of sources – aerial photography, satellite imagery and graphical representations – into a highly manipulated, and at higher altitudes distorted, representation of the Earth.

The accusation of imperialism levelled against the Mercator map has also been cited as a fundamental aspect of the power/knowledge structure of aerial and satellite imagery generally. In 'The omniscient eye: satellite imagery, "battlespace awareness", and the structures of the imperial gaze', Harris (2006) writes that, '[...] satellite imagery, photo recognisance and image interpretation [...] produces objectivity, a techno-discursive distance

[25] For a detailed examination of the arguments for and against the Mercator projection, see Monmonier, 2004.
[26] TerraMetrics. Available at: http://www.truearth.com [Accessed 19 May 2015].

between the observer and the observed, and a particular kind of modern surveillance subject. This subjectivity is structured by an omniscient, imperial gaze, a particular kind of subjectivity that signifies dominance over what is being observed'. While Harris is discussing Google Earth, these arguments can easily be applied to Google Satellite View. In fact, the two packages, as I will discuss in more depth later, use exactly the same image database. Harris' critique of satellite images states that 'the perspective is one of a totalizing, objectifying transcendent gaze, and allows one to transcend the subjective world; what Donna Haraway calls the 'God Trick' (Haraway, 1988, p.581), or what Denis Cosgrove has called the 'Apollonian Eye' (Cosgrove, 2001, p.x). This has been an essential ideological component of global control and conquest since antiquity. Its power as knowledge is derived from its position above and beyond subjectivity, and, as Cosgrove asserts, it is 'implicitly Imperial' (Cosgrove, 2001 p.15). If we accept Cosgrove's critique of satellite images as being 'implicitly Imperial', how would this be applied to Google's Satellite View? 'Imperial' implies empire; it implies a colonised people and a colonial power. But how does this relate to Google as a multinational corporation rather than a traditional nation state?

The origin and growth of modern mapping can be linked directly to the development of the early modern state. Maps were not founded from some primal instinct 'to communicate a sense of place, some sense of *here* in relation to *there*', but from the need of nascent states to take on forms and organise their many interests (Wood, 2010, p. 8). According to Denis Wood, maps as we know them only really date back five to six hundred years, and there was a mass expansion in the production of maps from the year 1500 onwards. Wood links this expansion directly to the rise of the early modern state and its role in the service of these states, either through their use for administering property interests and defining territories or as direct tools of military conquest. Fundamentally, the key power of maps was their ability to define and give shape to the state itself: *to perform the shape of statehood.* That is, to legitimise and naturalise the rule of the state to those both outside and inside the territory. Harley makes the case that these early states used maps as weapons of imperialism: 'Insofar as maps were used in colonial promotion, and land claims on paper before they were effectively occupied, maps anticipated empire' (Harley, 2001, p. 282). If mapping is directly related to nation states, and if satellite imaging is implicitly imperial, then what are we to make of Google Maps? A map produced by a global corporation, providing detailed mapping technologies, free of charge, to the peoples of any state or nation who can access a smartphone, tablet or computer. Should Google Maps be seen as a break in the interconnection between mapping and state power? A Promethean gift of the technological tools of state power? Or as a new form of power, the *Stato imperalisto della multinazionale* as dreamt of by the Italian Red Brigades, in which global corporations challenge the role and

legitimacy of nation states? Tracing the copyright information displayed on the bottom left of every Satellite View image used in the Manvers Digital Drift further produced greater insight into the origin of Satellite View and the relationship between Google and the US state.

The relationship between Google Maps and the US state is a complex one, and both can be seen as a disruption of the traditional role of mapping as integral to state power whilst renewing it through other, more diverse means, and it is the inclusion of satellite images that most closely ties Google Maps to the US state. The origin of Google Maps' Satellite View can be located in Google's 2004 takeover of Keyhole Corp. Keyhole Corp was a technology start-up co-founded by the National Geospatial-Intelligence Agency (NGA)- and the Central Intelligence Agency (CIA)-funded venture-capitalist firm In-Q-Tel.[27] It was named after the first series of American spy satellites to use electro-optical digital imaging, code-named 'Keyhole' (Harris, 2006). Keyhole's technology at the time of Google's takeover combined a multi-terabyte database of mapping information and images collected from satellites and aeroplanes with easy-to-use software,[28] and was a key supplier of governmental contracts. Keyhole technology was developed by Google before being rolled out as Google Earth and was combined with their own web-based mapping system to produce Google Maps. Google Maps uses the same satellite information as Google Earth, so many of the discussions about Google Earth's satellite images are relevant to Google Maps' Satellite View. Google has continued to work closely with the NGA and its partners in the procurement and advancement of its satellite images for Google Earth and Google Maps. Google partnered with the NGA in 2008 to help launch the satellite GeoEye-1, and the only difference between the GeoEye-1 images used for Google Maps and those used by the US military was the level of resolution of the images. In 2010 the relationship between Google and the NGA became even more tightly interwoven when the NGA awarded Google a $27m sole source (i.e. there were no other competitors) contract to supply 'Geospatial Visualisation Services'.[29] The justification for the contract is highly revealing about the level of investment the NGA had already put into Google Earth.

> This acquisition is for Commercial Geospatial Visualization Services for NGA. NGA has made a significant investment in Google Earth technology through the GEOINT Visualization Services (GVS) Program on SECRET and TOP SECRET government

[27] Cia.gov. 2020. *CIA's Impact On Technology — Central Intelligence Agency*. [online] Available at: <https://www.cia.gov/about-cia/cia-museum/experience-the-collection/text-version/stories/cias-impact-on-technology.html> [Accessed 25 March 2015].
[28] Googlepress.blogspot.co.uk. 2020. *Google Acquires Keyhole Corp – News Announcements – News From Google – Google*. [online] Available at: <http://googlepress.blogspot.co.uk/2004/10/google-acquires-keyhole-corp.html> [Accessed 25 March 2015].
[29] Oakland emails give another glimpse into the Google-Military-Surveillance Complex - https://archive.today/W35WU#selection-955.174-955.187 (Accessed 20/03/2015)

> networks and throughout the world in support of the National System for Geospatial (NSG) Expeditionary Architecture (NEA). This effort augments the current NSG architecture by expanding the GVS and NEA investments to the unclassified network in support of Department of Defense (DoD) Geospatial Visualization Enterprise Services (GV-ES) standardization. The NSG, DoD, and Intelligence Community have made additional investments to support client and application deployment and testing that use the existing Google Earth services provided by NGA. Google is the only identified source that can meet the Government's requirement for compatible capability across networks, global access, unlimited processing and software licenses, and access to the Google Earth-hosted content through widely used Open Geospatial Consortium service interfaces.[30]

Google is justified as the sole source for the $27m contract to supply Geospatial Visualization Services to the NGA on the grounds that the NGA and the intelligence community had already massively invested in Google Earth and a requirement of the services being procured was their compatibility with Google Earth.

DigitalGlobe, who supplied the satellite images of the Manvers roundabout, is an American corporation that merged with GeoEye in 2013. Its primary business is the sale of high-resolution satellite imagery and data to both commercial and government interests. During June 2014 DigitalGlobe received permission from the US Department of Commerce to sell commercial imagery at the best available resolution, something that had previously been restricted to military and intelligence agencies. DigitalGlobe is supported by the NGA's NextView programme, designed to encourage commercial interests in satellite imaging. As the NGA themselves put it, 'Commercial Imagery enables – Cooperation with federal, state, and local authorities in support of Homeland Security'[31]. What is apparent is that there is no clear separation between the US state, via the NGA, and Google Earth, and it is unlikely that Google Maps' Satellite View would exist at all without the aid, support and investment provided by the NGA and the reciprocal supply of Commercial Geospatial Visualization Services to the NGA.

The connections between Google Maps and the US state, its intelligence agencies and military could be explored further; however, it is important to establish that Google Maps,

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30 US Government Federal Business Opportunity, available at: https://www.fbo.gov/index?s=opportunity&mode=form&id=482ab868878ecd0bd81d978216718820&tab=core&tabmode=list [Accessed 26/03/2015]

31 National Geospatial-Intelligence Agency Commercial Remote Sensing, available at: http://www.nesdis.noaa.gov/CRSRA/files/Appendix_2.pdf [Accessed 26/03/2015]

whilst providing a world view and a symbol of globalisation, remains situated within a national and state framework. It has strong connections to the US Department of Homeland Security, the US military, and the US intelligence community. Google Maps, and Satellite View in particular, can be seen as playing an active role in surveillance. Harley (1988) has already noted that maps can be seen as a 'Technology of Power', and some of the practical implications of maps may also fall into the category of what Foucault has defined as acts of 'surveillance' (Foucault, 1995), notably those connected with warfare, political propaganda, boundary making, or the preservation of law and order. Google Maps have mutated far beyond the abuses made possible by traditional mapping practices. There is no universal reading of these satellite images. Context is important. For those using Google Maps situated in countries to which the US is hostile, satellite images are likely to signify a sinister message: 'We' can see 'You', 'You' have nowhere to hide. And with the increased use of drone planes by the US military, Google's comprehensive aerial photographic coverage of the whole Earth suggests, 'We' can strike 'You' wherever you are! It is no coincidence that the first images released to the public from the keyhole software, two years before it was taken over by Google, were fly-overs and zoom-ins of Iraq produced for television in support of the 2003 US-led invasion.

It is part of the success of Google as a global corporation and Google Maps in general that a technology rooted in the cooperation with the corporate-military-surveillance agencies of a single nation state could achieve such a positive global reception in popular culture and penetrate so deeply into everyday practice.

Participatory mapping

Satellite View also provides access to another of Google Maps' features. An extra panel is revealed at the bottom of the image, a strip of photographic thumbnails that can be scrolled through, each one a photograph uploaded by Google Maps users. As you place your mouse over a thumbnail a white line extends from the photograph to the location on the satellite image where the photograph was taken. The user-generated participatory content enabled by Google Maps provides yet another view of a particular terrain, and it is only here, among the uploaded photographs by Manvers workers and residents, that any footage of Manvers Main's former pit wheels can be found alongside Nicky Molyneux's photograph of his own bike in the centre of the monument to the people of Wath, Manvers Lake in flood from July 2008 by a Dearne man and a re-post, by Rene Schiffer, of a Satellite View image of a large yellow and red bunny monster with multiple legs devouring cars on Golden Smithies Lane, which has received 5,550 views. Google Maps' participatory photography is not restricted by time, and

here can be found historic images of the area such as redfordanger's upload of a photograph of a Wath road junction from the 1970s, with the smoke stack of the Manvers' coking plant visible in the background.

Participatory mapping practices allow the situated occupants of a location to produce their own mapping of significant sites by uploading photographs and GPS-tagging them to specific locations. Participatory mapping practices suggest a democratisation of the production of maps and have been enthusiastically received by a number of authors. Referring to Google Earth, but once again I think the sentiment also applies to the participatory practices enabled by Google Maps, Jerry Brotton, in *The history of the world in twelve maps*, writes that

> […] Google Earth […] has led to a complete re-evaluation of the status of maps and the future of mapmaking, allowing maps to appear more democratic and participatory than ever before. It seems that anywhere on the earth can potentially now be seen and mapped by anyone online, without the inevitable subjective bias and prejudice of the cartographer (Brotton, 2012)

Pickles (1995) also highlighted the potential of participatory mapping practices to disrupt the authority of the cartographer, enthusiastically quoting Vattimo:

> the world of generalised communication explodes like a multiplicity of "local" rationalities – ethnic, sexual, religious, cultural or aesthetic minorities – that finally speak up for themselves. They are no longer repressed and cowed into silence by the idea of a single true form of humanity that must be realised irrespective of particularity and individual finitude, transience and contingency (Vattimo,1992).

The implication here is that participatory mapping practices allow multiple voices to speak and multiple perspectives to emerge. Mapping finally catches up with Cubism's realisation that the truth of an object cannot be represented from a single viewpoint, but can only be approached from a multitude of perspectives. Pickles (1995) reinforces his argument by invoking Walter Benjamin's (1936) argument in his essay 'The work of art in an age of mechanical reproduction':

> The technique of reproduction detaches the reproduced object from the dominant tradition. By making many reproductions it substitutes a plurality of copies for a unique existence. And in permitting the reproduction to meet the beholder or listener in his own particular situation, it reactivates the object reproduced (Benjamin, 1936).

Benjamin suggests that mechanical reproduction will wither away the aura of the original work of art. Applying Benjamin's argument to participatory mapping practices, as Pickles does, this argument would suggest that the multiplicity of views, the democratisation of mapping through participation, ultimately withers away the aura and therefore the authority of the original map. In the case of the participatory mapping of Manvers, this argument would suggest that participatory mapping could ultimately undermine Google Maps' own corporate mapping of the area. Benjamin was writing relatively early in the development of photography and film. We now have seen these technologies penetrate deep into everyday life, and the circulation of images via the internet is unprecedented; yet their effect on original works of art has been the opposite of that suggested by Benjamin. The art market, and with it the art world, remains dominated by the individual or institutional ownership of 'unique' works of art. The more widely the reproduced images of a work of art are circulated, the greater the aura of the singular original is increased. Equally, in relation to the recording and distribution of music, the more a particular piece of music is reproduced and circulated, the greater the demand for the live original experience is increased. Returning to Google Maps, the addition of participatory mapping practices does not undermine the authority or aura of Google Maps; quite the opposite. Participatory practices are one element of Google's multiple views, but rather than working against each other, the multiple perspectives ultimately increase and reinforce the authority and global dominance of Google Maps. Google Maps have disrupted the traditional paper-based map with a digital map that provides a multiplicity of perspectives; however, Google Maps resolves its multiple perspectives into a single package that dominates the representation of the world with Google's own singular vision.

6.2.2 Google Maps Digital Representations in Practice

I have provided an in-depth critique of Google Maps' representational strategy. This analysis has shown how Google's corporate interests and its involvement in the US state are implicated in its representation of the Manvers area of South Yorkshire. I have suggested that its representational practices embody logics that have the potential to transform space. For example, the dominance of corporate advertising may encourage particular patterns of consumption, or the making visible of the liminal spaces used by prostitutes has the potential to alter the policing of these areas. These findings open up potential future research that would require very different tools from the performance practice that was central to the Manvers Digital Drift. This chapter opened with a performance insert that provided a very different form of spatial representation, the performance writing that emerged in response to the use of Google Maps while participating in the Manvers Digital Drift. This was a fragmented, subjective, emotional representation of the location that drew from personal and

collective memory. The key question the Manvers Digital Drift raised was 'how can there be such a divergence between the personal subjective and emotional imaginary that emerged from the maps' use within the context of the drift and the corporate/state power traced by critical cartography within Google Maps' symbolic terrain?'

The performance writing and the critical cartography represent two separate paths radiating from Google Maps, two paths that travel in opposite directions. The first is critical cartography's tracing of power and control embedded in Google's symbolic representation backwards from Manvers to the origins of its production. The second is a montage of emergent thought images, personal narratives and imagination inspired by Google's representations of Manvers experienced through the drift. Both were features of the digital drift as participants moved between critical analysis of the map and storytelling inspired by the features, history and landscape being represented. Critical cartography suggests that power dominates and reproduces itself through representational practices; in contrast, the performance writing suggests that the grip of representational power is not secure. The digital drift was not a typical use of Google Maps. Its performative strategies were conducive to a more transgressive imagination, but it did indicate that forms of practice have an important impact on how representational strategies are inscribed through their use. I can envisage a closer alignment between Google's spatial representation and the spatial understanding produced through a more traditional use of Google Maps. The key point is that representations have no power by themselves. Power only has a concrete meaning when exercised as a set of practices. It is power's reliance on practice, not semiotics, that can start to explain the divergence between Google Maps' symbolic representation and the digital drift's emergent imaginary.

In this section, I will answer the research question *What happens to digital representations of space when they become part of the lived experience of space?* This question is answered by using the experience of the Manvers Digital Drift to explore the process whereby Google's digital representations produced new understandings of the Manvers area. Analysing the practices through which Google's digital representations were actualised into the spatial imaginary of the drift requires me to develop a new lexicon to describe the process.

I will use the empirical experience of the Manvers Digital Drift to trace Google's digital representation of the Manvers area as it enters the process of collectively forming an individual understanding of this space. I will draw on both the personal experience and observations gathered from participating in the drift. I will develop a lexicon that builds on the observations of the previous chapters to describe what happens to Google Maps'

representations of the Manvers area when they were collectively experienced through the digital drift. Developing the language to describe this process will be especially useful for developing a theoretical framework for understanding what happens to representations of space embedded within digital technology when they become part of the lived experience of space. I will progress by defining key terms that are central to understand the process whereby digital technologies redefine understandings of space through their digital representations.

6.2.2.1 Technology

If we are to understand technology as a process-based concept we need to redefine the current understanding of this term. A good starting point is Foucault's use of the term 'technology'. Foucault's use of this term implies more than simply a machine, a tool or architecture, it suggests some form of tool or apparatus combined with a set of human practices. For example, in *Discipline and punishment*, Foucault suggests that '[discipline] […] is a type of power, a modality for its exercise, comprising a whole set of instruments, techniques, procedures, levels of application, targets; it is a "physics" or an "anatomy" of power, a technology' (Foucault, 1995, p. 215). And, as Stuart Elden points out in *Mapping the present*, '[Foucault] […] suggests that technology should not simply be thought of as technologies of wood, fire or electricity, but also government'. (Eldon, ….) He understands *techne* as a 'practice', as a *savoir-faire.* Technology should, therefore, be considered to be some form of tool or apparatus combined with a whole set of human practices: the affordances and material reality of the technology combined with the human practices that operationalise it.

The experience of the Manvers Digital Drift suggests that Google Maps should be seen not just as a representation of space, but, in Foucault's extended meaning of the term, as a technology in the production of space. It should be seen in its totality as both a representation and a set of related practices. In this view the 'power' of Google Maps, as exposed by critical cartography, must be understood as being exercised in practice rather than inherently possessed: a set of situated practices that are contingent and relational and implicit both in the production of the map and in the map's use. This does not mean that critical cartographies are incorrect in their tracing of power in representational practices. It means that representations should also be researched from the perspective of how the logic implied by their representations contextually manifests through social practices.

Kitchin and Dodge (2007) have stated that we should 'rethink maps' in terms of,

> …a shift from ontology (how things are) to ontogenesis (how things become)'. They state that 'maps emerge in process through a diverse set of practices. Given that practices are an ongoing series of events, it follows that maps are constantly in a state of becoming; they are ontogenetic (emergent) in nature. Maps have no ontological security, they are of the moment; transitory, fleeting, contingent, relational and context-dependent. They are never fully formed and their work is never complete. Maps are profitably theorised, not as mirrors of nature (as objective and essential truths) or as socially constructed representations, but as emergent (Kitchin and Dodge, 2007, p. 340)

Viewing maps as processual and in a constant state of becoming acknowledges the fundamental importance of practice in both the production and use of maps. It returns agency to the map user, and can account for the variation in how a particular map is read and its ontological lack of fixity over time. However, whilst stating the case for viewing maps as processual, Kitchin and Dodge (2007) dismiss the role of representation within the process of the map's becoming. They 'fold the person and the representation into each other in the act of transduction' (See 7.5.6) and in doing so representation is unproblematically dissolved into process and 'cartography is reposition as a processual, as opposed to representational, science'(Kitchin and Dodge, 2007, p.342). The consequences of shifting the discourse around mapping away from representation to process is to focus attention on 'what cartographers do (undertake contextual science) – not what they say they do (undertake objective science) – and how people bring maps into being to solve relational problems in ways that extend beyond a naïve understanding of map use (Kitchin and Dodge, 2007, p.343).

From the point of view of the Manvers Digital Drift, a collective, complex and nuanced bringing into being of Google Maps' representation of the Manvers area of South Yorkshire, I want to support the ontogenetic approach suggested by Kitchin and Dodge (2007), but argue that the processual and the representational should not be opposed to each other. My thesis argues that the representational should be viewed as an essential, problematic and active logic in the process of a map's becoming. The value of the ontogenetic, or processual, approach is to focus attention on the specific cultural, economic and situated practices, the will to power, involved in the work of the cartographer and the complexities, specific context and practices of the users that bring the map into being. It is clear that maps are subject to a continuous process of production, both in their use and in their creation; however, there remains a fundamental gulf between the practices of the cartographers, in our case Google Maps, and the practices of the users of maps. This gulf can only be filled by the specific form of the map itself and the representational practices it employs.

Google Maps' spatial representation played a direct, but not a determinist, role in how the Manvers area was understood by participants in the drift. This can be shown through the direct references that arose to the maps' digital representations. For example, one participant pointed out that it is 'always a sunny day' in Google Street View; another participant described the strange feeling created by Street View's blurring of faces. It is the representational nature of the map that unites the desperate practices of creators and users of a map. It is the medium that mediates between the two poles of practice, and as such cannot be reduced simply to the processual nature of the practice that either produces it either through the technical creation of the map or through the processual practices of using the map. The map received by a user is the end result, the frozen residue of the process of its creation by the cartographer: it is decontextualised, set loose from the context of its production to be reactivated and produced in the act of using the map. As a collective process the map embodies the will to power that drove its creation within its representation, and this representation acts as an active force embedding a whole set of logics into the ontogenetic becoming of the map. However, this is not a deterministic force. For example, Google Maps' representation of Manvers outlined in the Map View – 'Corporate Constellations' subsection of this thesis describes the way Google Maps provides a specific corporate representation of Denman Road, yet this is at total odds with the way this map was used within the drift by Laura Grace Ford and myself to mythologise the '90s subculture of Denman Road (See Performance Writing). In the comparison of these two representations you can see the two poles of practice. In the first the corporate interests of Google are incorporated into its cartographic representation, and in the second this cartography is used to bring into being a shared cultural memory through storytelling. In this example, two poles of practice compete. However, it is the form of the representation that enables the interaction.

I agree with Kitchin and Dodge (2007) that maps should be understood processually as events rather than objects. However, I would argue that the findings of the Manvers Digital Drift show that representation should be repositioned as an active force in the processual act of a map's becoming. I will name this repositioned understanding of representation a 'potential space'.

6.2.2.2 Potential Space

The Manvers Digital Drift focused on Google Maps' representation of Manvers, on the outskirts of Wath-upon-Dearne in South Yorkshire, whilst remaining situated in East London. Yet the medium of Google Maps repeatedly links Manvers back to the US, and California in particular. Any attempt to explore Manvers through the medium of Google Maps inevitably has to be explored through the practices situated in both locations, through the situated

practices of the producers of the map and the situated practices of the users of the map, in our case East London.

Figure 11 - Richard Barbrook and son participating in the Manvers digital drift

Google is situated in Mountain View, a district in the area of California that has been branded Silicon Valley because it contains many of the world's largest high-tech corporations and start-up companies, including the headquarters of Apple Inc., Facebook, Intel, Cisco Systems and Lockheed Martin. Silicon Valley has its own particular social and economic history that combines to form a dominant worldview – what Richard Barbrook and Andy Cameron have caricatured as 'the Californian Ideology'. 'The Californian Ideology was developed by a group of people living within one specific country with a particular mix of socioeconomic and technological choices. Its eclectic and contradictory blend of conservative economics and hippie radicalism reflects the history of the West Coast […]' (Barbrook and Cameron, 1995). Google embodies many of these contradictions highlighted by their code of conduct, that states:

> "Don't be evil". Googlers generally apply those words to how we serve our users. But, "Don't be evil" is much more than that. Yes, it is about providing our users with unbiased access to information, focusing on their needs and giving them the best

> products and services that we can. But it's also about doing the right thing more generally – following the law, acting honorably and treating each other with respect.[32]

Google Maps emerged from a particular cultural view of space, and as such the knowledge they encode is bound up with the particularities of the political, ideological, economic and cultural forces, Google's corporate will to power, that brought it into being. The Manvers Digital Drift was only capable of providing the most fleeting of insights into Google's corporate will to power. It was restricted to a hermeneutics of signs in its representational landscape, to a tracing of the lines of flight emanating from its metadata, such as copyright, and the intuitive uncanny sensations produced from its imagery: its blurred faces, its inconceivable weather conditions, its elevated cartography, its construction of surveillance subjects and its multiple perspectives and levels. To truly understand Manvers from the perspective of Google Maps would require an intense period of drifting Mountain View, CA.

Restricted to the experience of the Manvers Digital Drift, a few observations and intuitions can be cited. From the perspective of the developers of Google Maps, a key economic will to power that is subsumed is Google's drive to make a profit. The two key methods through which Google Maps makes a profit are advertising and the supply of geospatial visualisation services to the National Geospatial-Intelligence Agency. These central concerns act as dynamic forces at each level in the process of the production of Google Maps.

Google Maps' potential space should not be seen as a potential to produce a future space, as somehow prefiguring the transformation of an actual space. Google Maps' digital representations are not hylomorphic, imposing a predefined form onto matter. While this is a potential effect, Google Maps' potential space should be seen as the actualisation of a process, bringing together a whole set of intensities driven by the corporate will to power of those who construct them. The potential space is, however, freed from the context of its creation. It is freed to leave the contextual domain of its production and traverse multiple contexts and domains. The Manvers Digital Drift can be seen as one of many possible contexts that Google Maps' potential space can enter as a potential and transformative force. Potential space is defined as the embedded logic of the domain of its creation carried by representation into the context of its use, where it functions as an attractor for patterns of thought, behaviour and organisation through human and more-than-human processes. To break this definition down a little, let's return to the Manvers drift. Google Maps carry the ideological and corporate logic embedded by the context of its production into its

[32] Google, 'Code of Conduct', available at: https://investor.google.com/corporate/code-of-conduct.html [Accessed 21/6/2015]

representation of Manvers. For example, Google's revenue stream that comes from advertising drives the overlaying of the Manvers area with the locations of multinational corporations. The representational form of Google Maps carries Google's ideological and corporate logic into the context of its use. Its use in the case of the Manvers Digital Drift was as a performative practice that rejected the corporate logic, challenging it with personal and cultural memory and storytelling. The type of social practice is essential to the way representations are actualised. As I stated earlier, the digital drift was not a typical use of Google Maps, and I can envisage a closer alignment between Google's spatial representation and the spatial understanding produced through a more traditional use of Google maps (See Zook and Graham, 2007a).

What is important to take from these findings for ubicomp and mobile computing is that digital representations embody the conceptual beliefs, values and desires of those who produce them. However, digital representations are transformed through the context and type of practice of their use. Google Maps inspires and affords usage far beyond the solving of relational problems and these less obvious uses of maps should not be excluded from the study of how people use maps and the role digital representations play in the construction of an understanding of space. This suggests that future ubicomp and mobile computing research should focus on the ideological logic of the representational models they embed and on the processes through which digital representations become actualised through practice. This observation also has an impact on the political use of psychogeography. Like Google Maps, psychogeography engages in representational practices. It produces potential space through the use of myths, image and narratives. Spaces are overlaid with stories that animate it in different ways that can be suggestive of, and inspire, new spatial practices.

Chapters 4 and 5 argued for space to be understood as interlocking circuits of virtual and actual space brought together through human and more-than-human practices. Both virtual and actual space are real. In contrast, potential space is not real space. It remains a logic which functions as an attractor through social practice to transform virtual and actual space.

6.2.2.3 Actual space

One of the significant findings to emerge linking all the drifts was the impact of the physical terrain. Architecture and landscape were key topics of discussion in all the previous drifts. The physical terrain offers aesthetic affordances to the walker that are not only affective but also suggest and inspire interpretation. The territory within which a drift takes place can be shown to play an active role in how the space of the city is interpreted and understood.

An interesting and unexpected aspect of the Manvers Digital Drift was that participants responded in a similar way to the projected images of the landscape and architecture in that their affordances sparked conversations and provoked stories, memories, speculative theories and discussions. Participants were located in an exhibition in a shop near Old street, Hackney, London. They were surrounded by other artworks and the sound of deep bass rumbles from a performance by Alistair McClymont. The actual space of the drift was at odds with the projected image, however: when participants were engaged with the drift their response to the projected images was socially similar to that of the physical drifts carried out within the streets of East London. It was as if the participants experienced the architecture and landscape synaesthetically: for example, references to the 'heat' of the images or the physical 'size' of the Next building. Participants were willing to disengage with the actual space of the shop and imagine themselves within Google Street View's Manvers simulacrum. The participants were able to mentally occupy Street View's digital representation of Manvers through their social interactions, imagination and affective responses. To understand the digital drift we must take into account the actual space of the shop, the actual space of Manvers, the potential space of Google Maps and the virtual space the participants brought to the digital drift in the form of personal, cultural and political narratives.

6.2.2.4 Virtual space

I came to the Manvers Digital Drift with a visceral and emotional attachment to this location. It is the site of my childhood, the former workplace of my grandfather, and my mother's final workplace before her retirement. I arrived with a romantic and dystopian vision of the post-pit-closures decay, having spent a number of years unemployed, wandering this landscape through boredom. My body continues to react to some areas with anxiety, not because they are actually threatening, but because I hold an internal map of tribal antagonism between teenage gangs who have long since grown up and moved on. The site is haunted by stories of the miners' strike. Stories I have been told by miners who worked in Manvers Main, stories of the intense heat in the confined tunnels. Stories that I know have been embellished and malformed to such an extent that I can no longer recall the facts. I bring memories of council estates, not from above looking down from a satellite, but from within. Flats on the Patio estate in Swinton, barely furnished, where you could get your head shaved and a bucket bong while you waited. Characters like Jud, a working-class skinhead who played Jamaican ska music on bass cabs made from an old wardrobe, or Cal, who taught many of my friends to read. I have memories of intense relationships, former girlfriends and sites in the landscape that will be forever marked with secrets. I could map the best locations to go mushrooming in the autumn and I could find the GPS coordinates for my earliest memory; a large drop of rain landing on my leg as I pedalled a tricycle. I remember the sickly smell of bitumen from the Croda factory and the thought of Aitken Road gives me a strange subtle aching inside the bones of my leg, somewhere between my patella and femur, that I link to a half-remembered image of the colour mustard, the imminent threat of violence

and a row of cars desecrated along one side with a continuous line of swelling, bubbling, flaking paint exposing the underlying aluminium: a corrosive paint stripper attack on their surface veneer. This is the personal representation of the Manvers area I embody. My personal embodied representations of Manvers; my virtual space.

Virtual space is not the material substance that makes up a space; the actual space. Virtual space is an individual's embodied mental representation of a space. Virtual space belongs to actual space as its virtual register, but not its mirror. It is the very real spectral haunting of actual space, the personal and collective ghosts that swirl around all structures, all places, all landscapes; a spatial instance of what Deleuze describes in *Difference and repetition* as the virtual. For Deleuze the virtual must be defined as strictly a part of the real object, as though the object had one part of itself in the virtual into which it plunged as if into an objective dimension (Deleuze, 1994, p.209). The virtual is opposed not to the real but to the actual. The virtual is fully real in so far as it is virtual (Deleuze, 1994, p.208). Virtual space is not an image or a copy of the actual, it is a sensual, multidimensional, and simultaneously intangible and vivid. It resides in multiple interlocking layers, some more reachable than others. In this respect virtual space has no resemblance to the actual space that it is a part of. My virtual space of Manvers included the residue of my previous experience and knowledge of the area. Virtual space can be seen as a personal representation that, whilst formed from past experience, does not reside in the past. Virtual space summons the residue of experience into the present moment, and is produced in the process. Each act of recall is a transformative act of production.

Virtual space is not pure subjectivity, isolated and constructed within individual consciousness. It is formed through both the very personal sensorial experience and is modulated by wider cultural interaction and memory. It is transformed through social interaction, the affordances of the physical environment and representation potentials exemplified by maps, plans and digital representations.

The Manvers Digital Drift brought multiple spatial potentials together, and the result was a disruption of the participants' understanding of East London and the Manvers area. It is the act of bringing competing spatial potentials together through an event that individual understandings of space are disrupted and new understandings of space can take form.

6.2.2.5 The Event

The event is map use, is the contextual bringing together into coexistence the virtual space of the user, the actual space of the physical environment and the potential space of the map. The

event is the moment that disparity, discontinuity and conflicts between these different domains dephase the map user's mental representation of space. It is a creative process that disrupts the fixity of the user's mental representation of space.

As virtual space is real, then real space is changed even if the actual space remains the same, 'although nothing changes, the thing all of a sudden seems totally different - as Deleuze would have put it, it is the thing's intensity which changes' (Zizek, 2007). The participants' understanding of the Manvers area is permanently altered through the act of the digital drift. Those whose starting point was no knowledge of Manvers will have left the drift with some degree of virtual space associated with the experience. However, as the drift itself was situated at 70 Paul Street, Hackney, London, Manvers becomes part of the virtual space of this situated location; part of the actual space of East London.

The Manvers Digital Drift brought together through the event multiple potentials from different domains. For example, the corporate worldview of Google Maps' potential space, the actual space of Manvers, the actual space of 70 Paul Street and the virtual space of all those who took part and contributed to the drift. The outcome for the participants was the production of a modulated and transformed post-drift virtual space. From my perspective, a virtual space that melds memories with a hallucinatory landscape of intense blue skies and blurred-faced ghosts; scopic visions that could never be experienced through a visit to the actual space of Manvers, but visions that now form part of my understanding of this space, and therefore part of the reality of Manvers.

The moment of bringing competing spatial potentials together can be shown to instigate a transformation in spatial understanding. However, it is within the period of reflection after such an event that a disrupted spatial understanding solidifies to form a new transformed spatial imaginary. Experience can never be fully recalled after an event. Some elements are remembered, others are forgotten, some are embellished and others the subject of further recall and conversation, and therefore modulation. The friction between the event and its re-representation is mirrored within this study through the use of performance writing. However, I would argue that it is through the process of reflection that stable mental representations emerge from the disruptive experience of an event. This is the temporary stabilising of a spatial representation, a virtual space.

6.3 Conclusion

The chapter asked the research question *What happens to digital representations of space when they become part of the lived experience of space?*

This question was interrogated through the development of an experimental psychogeographical drift; a performance event that collectively explored the Manvers area of Wath, South Yorkshire, through the medium of Google Maps. The event was used as a thought experiment to disrupt the participants' understanding of this location, enabling a study of the role digital representation plays within the development of a personal subjective understanding of the location. My findings were analysed from two perspectives: a critical cartography of Google's representational practices and the observations and experience of participating in the Manvers Digital Drift. The experience of the Manvers Digital Drift found that the answer to the research question is that digital representations of space play an active, but not deterministic, role in the production of an understanding of space. Digital representations carry the logic of the context of their production into the context of their use where they are activated through social practice. Social practice initiates a process of destabilising personal understandings of a location by bringing digital representations together with the affordances of the material reality of the location and the individual's prior understanding of the location. This destabilisation solidifies to form a new personal understanding of space after the event through reflection. To aid the discussion of this process I have defined the key parameters involved as actual space, virtual space and potential space and suggested that these parameters should be understood from the ontogenetic perspective of process. This spatial model will be developed in the conclusion by drawing from the findings of all three chapters presented in this thesis.

The findings of this study suggest a shift in how digital representations are understood and approached by researchers interested in technologies that produce digital representations of space. It emphasises the important role of representation in conveying meaning and logic from the context of its production to the context of its use. It suggests greater critical engagement within the field of ubiquitous and mobile computing in the social, political and ethical models embedded within digital representations and the spatial understandings and active reordering of space that emerge through practice. The findings have a particular application for a philosophical and theoretical discourse of spatial technologies, such as mobile phones, locative media and wearable devices, that spatially situate data. It also has implications for artists, writers and cultural geographers interested in understanding how spatially situated cultural works produce understandings of space in practice.

7 Conclusions

Recent years have seen a rapid convergence between the physical space of the city and digital technology. Ubiquitous and mobile computing has proliferated throughout urban space; it has been widely adopted by its inhabitants and slips into the background experience of everyday life. As ubiquitous and mobile computing becomes implemented in real-time, real-world environments they breach their own disciplinary boundaries. Once active in the city, digital spatial systems become entangled in wider cultural systems of meaning and power. They become embroiled within the complexity of how individuals produce understandings of space, which is simultaneously personal and emotional, yet also social, cultural and political.

The impact of 'the digital' on urban space should be understood broadly to include ontics, aesthetics, logic and discourse (Ash et al., 2018). Ontic describes the materialities of digital technologies: for example, the material infrastructure of digital devices, fibre-optic cable wireless signals, and data centres. Aesthetics names the bodily reaction, the look, feel, affect, and spatial imaginary that digital technologies bring into being in urban space. It describes the embodied experience governed by the ways digital technologies contribute to the ambient conditions of everyday life. Logic is the reordering of physical space and the rhythms and flow of the city resulting from digital representational practices. Discourse focuses on the narratives, cultural myths, ideologies and assumptions that stabilise and destabilise power and control through digital means. The digitally expanded city, defined by these terms, is taken as a fundamental phenomenon to be understood.

Researching such phenomena required an interdisciplinary approach that could bring into dialogue the city, the body and digital technologies. The digitally expanded city cannot be understood through a study of a single technology, city or people. It is only through researching the dynamic relationship between these entities that a complex understanding of the digitally expanded city can emerge. Fine art performance practices that take place directly in the city open up research opportunities to engage with the complexity of the digitally expanded city. They are particularly attuned to the materiality, aesthetics, affect and critical theory that define the digitally expanded city. Jane Rendell states that 'My hope is that the work of artists critically engaging with sites outside the gallery can help develop an equally influential terrain of spatial understanding through critical practice, as well as critique through spatial practice'(Rendell, 2008), and Harriet Hawkins (2012) notes that 'geographers' research on the sensuous, psychic and subversive urban engagements of the Situationist International, and their legacies, offer early indications of art's value in this area' (Bonnett, 1992; Pinder, 2001). My literature review found that while there is substantial academic

literature on psychogeography, including its influence on locative media, there has been no substantial study that attempts to expand its practices to engage with the complexity of the contemporary digital city. This thesis fills this gap by developing an original psychogeographically-influenced art practice that expands psychogeographical techniques to answer the research question 'What can a psychogeographical art practice reveal about the production of the digital expanded space in East London?'

East London was selected because the area is a major site of digital production and also has historical ties to the practices of psychogeography. The research question was answered by making three distinct cuts into the digital geography of East London. The first focused on the embodied and subjective experience of walking East London. The second explored the materiality of East London's digital infrastructure, and the third researched the impact of Google Maps' digital representational practices on how people construct an understanding of space. Following Deleuze's concept of minor science, this thesis did not impose an initial problem onto the research but rather engaged in a process of finding through developing a performative walking practice based on the concept of the psychogeographical drift. Four drifts were organised. Each new drift iteratively built on the findings of the previous one and expanded the techniques of psychogeography to focus participants' attention on digital aspects of East London.

1) The first drift, 'In the Cleansed Spaces the Wild Flowers Did Grow', followed, as closely as possible, the walking technique of the drift originally devised by the Situationist International, and focused on the general ambience and social and political background of Hackney Central. It took seriously the argument that space and spatiality is always already 'marked by circuits of digitality' that are themselves irreducible to digital systems (Ash et al., 2018). This drift helped to develop an understanding of how spatial subjectivities are produced in practice, and answered the research question 'What can a psychogeographical art practice reveal about how spatial subjectivities are produced in the digitally expanded city?'

2) 'The Manvers Main Complex'. Abandoning the usual conventions of walking the streets, this drift used a 3.5-metre wide projected image of Google Street View and a wireless mouse to navigate through a landscape of projected streets. The Manvers Main Digital Drift focused the participants' attention on Google's digital representational practices and helped to answer my research question 'What can psychogeography reveal about what happens to digital representations of space when they become part of the lived experience of space?'

3) The third drift, ‘Invisible Geographies’, built on the observation that digital technology represents an invisible presence in the city. It made use of radio frequency (RF) receivers to convert the machine-to-machine communications of digital technologies into sound. The drift brought the attention of the participants to the more-than-human geographies of digital communications networks. The Invisible Geographies drift revealed the usually inaccessible unique spatial qualities of ubiquitous and mobile technologies.

4) The fourth drift, ‘Searching for the Cloud’, continued the investigation into the unique ontic qualities of digital infrastructure through a drift that sought the physical sites that enable cloud computing. This drift followed the route of underground fibre-optic cables to link seven of the key sites in the London Internet Exchange that enables London’s internet, connecting it globally. Drifts 3 and 4 combined to answer the research question ‘What can a psychogeographical arts practice reveal about the role infrastructure plays in the production of the digital expanded space of East London?’

In this conclusion, I will provide a summary of each of the sub-questions which have been answered in depth in Chapters 4, 5 and 6. I will then bring together the findings of all four drifts to present three overarching contributions. The contribution takes three distinct forms: 1) A framework and lexicon to rethink spatial production in the digitally expanded city; 2) A new understanding of the impact of ubiquitous and mobile computing on the experience of East London, and 3) An understanding of the kinds of knowledge a psychogeographical arts practice can produce. This will conclude by answering the final research question ‘What are the critical and philosophical implications for future ubiquitous and mobile computing research raised by the findings of a digitally expanded psychogeographical art practice?’

The thesis closes by suggesting further refinements to develop a digital psychogeography and outlining future work.

7.1 Research Questions

In this section, I provide a summary of each sub-question which has been answered in depth in Chapters 4, 5 and 6.

7.1.1 Questions 1 - Spatial Subjectivities

What can a psychogeographical arts practice reveal about how spatial subjectivities are produced in the digitally expanded city?

Chapter 4, Virtual Space, analysed the findings of a drift that explored Hackney Central and provided an in-depth answer to this research question. I will summarise the findings here.

The Hackney Drift found that its collective nature and strategy of viewing the everyday as strange reveals processes that produce spatial subjectivities. It revealed thee significant processes, that can be divided into the following categories: 1) Affect. 2) Memory and perception, 3) Spatial narratives.

It found that the participants were affected by the sense or feel of particular locations, and this played an important role in how they formed an understanding of key sites. Being affected by a site was not an individual response. It was an unspoken pre-conscious response that passed through the walkers, altering their behaviour: for example, the drift suddenly halting at Benjamin Close without prior discussion. This thesis argues that such felt intensities became part of how space is understood and remembered. Not all sites have an equal intensity of felt experience and this helps to form what I have defined as affective zones. Affective zones describe a virtual landscape of intensities of feeling that form an embodied, sensible mapping of a landscape.

The Hackney Drift presented a clear link between personal memory and the creation of collective cultural memory in the form of spatial narratives. Psychogeography as a practice encourages participants to observe, experience, interpret and narrate the city. Spatial storytelling was one of the most noticeable aspects of the drift. Sharing spatial memories is part of an important process of assigning meaning to locations within the urban environment. While personal memories play an essential role in forming an individual understanding of space, the public storytelling and mythologising of sites helps to form social relations between people and particular locations. The Hackney Drift exposed friction between the spatial narratives produced by members of the drift and the dominant spatial narratives of Hackney as a borough. To explore the relationships between these conflicting narratives within my research, I defined the storytelling that gives meaning to a particular location for a particular cultural or political sub-group as minor spatial narratives. Minor spatial narratives assemble people around particular representations of space, representations that may be at odds with the more dominant narratives of the very same location. The official narratives of a particular location I describe as major spatial narratives. I have argued that major spatial narratives compete and conflict with a multiplicity of minor spatial narratives. Spatial narratives describe a spatial politics of antagonisms and competing claims on territory with the potential to transform physical space.

The drift found that from the perspective of walking Hackney it was impossible to disentangle digital processes from the complexity of wider spatial processes. The Hackney Drift suggested that people do not really distinguish between the physical and the digital in forming understandings of site through the use of mobile computing. Digital tools retreat into the background experience of the city. Ubiquitous and mobile technology become invisible in use. For example, on the Hackney Drift, searches carried out on the old Hackney Library using the internet on a mobile phone flowed into the general conversation and construction of the meaning of that location. No distinction was made between digital information and the information gathered through being in the location. The two complemented each other in the formation of the site. The digital in this context is not separated from other forces that form spatial subjectivities.

The answer to the research question is that the combined processes of affect, memory and spatial narratives play important roles in forming special subjectivities. Digital technologies play an important role within this process; however, digital technologies disappear into the background of perception.

7.1.2 Questions 2 - Digital Infrastructure

What can a psychogeographical arts practice reveal about the role infrastructure plays in the production of the digital expanded space of East London?

Chapter 5, Actual Space, analysed the findings of two drifts, Invisible Geographies and Searching for the Cloud, using the combined findings to provide an in-depth answer to this research question. I will summarise the findings here.

An important finding was that East London's digital infrastructure is either hidden or becomes invisible through familiarity and use. East London is a key location for London's internet infrastructure, housing nine of the sixteen data centres that make up the London Internet Exchange. East London is also home to a large number of digital industries. Digital technologies impact on the space of East London at many levels; however, as you walk the streets there are few traces of its material presence. Digital infrastructures are designed intentionally to be integrated with the built environment, becoming invisible, transparent or camouflaged as 'nature'. Invisibility is not a natural aspect of infrastructure. My thesis argues that the invisibility of digital infrastructure is rooted both in the theoretical origins of ubiquitous and mobile computing and by post-9/11 security concerns that form the political climate within which they have developed. Security concerns are particularly central to the invisibility of the sites that form the London Internet Exchange. However, this thesis argues

that an HCI-disciplinary reading of Heidegger's phenomenology, and in particular his concepts of ‘ready-to-hand’ and ‘present-at-hand’ is at the core of a wider digital infrastructural invisibility and the creation of ‘black box’ entities such as cloud computing. As ubiquitous and mobile computing increase, the invisibility of these technologies raises important ethical and political questions. For example, if ubiquitous computing devices aim to ‘weave themselves into the fabric of everyday life’ (Weiser, 2002) how does a society consent to such vast harvesting of data from everyday life if the technology remains invisible?

I explored the invisibility of digital infrastructure by organising two drifts that extended the usual practices of psychogeography by disrupting the participants’ typical relationship to digital infrastructure. The first, Invisible Geographies, provided walkers with RF receivers that enabled them to listen in to the radio transmissions of digital devices. The Invisible Geographies drift revealed a more-than-human geography of machine-to-machine communications far beyond our personal use of these technologies. For example, my mobile phone regularly broadcasts and receives data, even when it is not in use. Extending the psychogeographical drift through the use of RF antennae helped to orient the participants’ attention towards the material qualities of digital infrastructures. Participants started to develop their own spatial imaginaries through listening to the sound of these transmissions.

The second, Searching for the Cloud, encouraged participants to explore East London’s key physical sites that form the London Internet Exchange. The affective properties of digital infrastructure were particularly pronounced near the physical sites that form the London Internet Exchange, especially the Telecity and Global Switch campus. What was apparent from the Searching for the Cloud drift was that East India Dock Road marks an affective border between two starkly contrasting environments. These large data centres produce an eerie, securitised atmosphere that is experienced primarily as felt rather than rationalised. These structures hide their presence. However, in doing so they create affective zones. It is through the experience of walking East London’s digital infrastructure that an embodied understanding of the materiality and ambience created by digital infrastructures started to be understood. My research argues that an expanded psychogeographical art practice revealed the affective qualities of East London’s digital infrastructure.

The answer to the research question is that an extended psychogeographical practice makes the ‘invisible’ digital infrastructure knowable to the participants. It found that the materiality of the digital infrastructure affected the participants, inspiring new spatial imaginaries to emerge. This finding suggested the potential role of a digitally expanded psychogeographical

practice as a form of radical pedagogy, making invisible digital infrastructures knowable and bringing them into wider discourse through the poetic imagination they inspire.

7.1.3 Question 3 - Digital Representation

What can psychogeography reveal about what happens to digital representations of space when they become part of the lived experience of space?

Chapter 6, Potential Space, analysed the findings of the Manvers Digital Drift to provide an in-depth answer to this research question. I will summarise the findings here.

This question was interrogated through the development of an experimental psychogeographical drift, a performance event that explored the Manvers area of Wath upon Dearne, South Yorkshire, from a disused shop located in East London, through the medium of Google Maps. The event was used as a thought experiment to disrupt the participants' understanding of this location, enabling a study of the role digital representation plays within the development of a personal, subjective understanding of a location.

The experience of the Manvers Digital Drift found that the answer to the research question is that digital representations of space play an active, but not deterministic, role in the production of an understanding of space. Digital representations carry the logic of the context of their production into the context of their use, where they are activated through social practice. Social practice initiates a process of destabilising personal understandings of a location by bringing digital representations together with the affordances of the material reality of the location and the individual's prior understanding of the location. This destabilisation concretises to form a new personal understanding of space after the event through reflection.

The findings of this study suggest a shift in how digital representations are understood and approached by researchers interested in technologies that produce digital representations of space. It emphasises the important role of representation in conveying meaning and logic from the context of its production to the context of its use. It suggests greater critical engagement within the field of ubiquitous and mobile computing into the social, political and ethical models embedded within digital representations and the spatial understandings and active reordering of space that emerge through the logic of their use.

7.2 Key Contributions

In this section I bring together the findings of all four drifts to present three related contributions to digital spatial research which, when combined, answer the research question 'What can a psychogeographical art practice reveal about the production of the digital expanded space in East London?'

The contribution takes three forms:

1. The first is a conceptual contribution in the form of a critical framework and lexicon. It contributes a meta-model that emerged through the process of analysing all four drifts.

2. The second contributes to the understanding of the spatial impact of ubiquitous and mobile computing on the experience of East London. It presents an overview of the geography of East London that emerged from the combined psychogeographically-inspired drifts presented within this thesis.

3. The third contributes to an understanding of using a psychogeographically-inspired performance practice within spatial research by summarising the kinds of knowledge psychogeography produces. It concludes by bringing together the findings of all four drifts to answer the research question 'What are the critical and philosophical implications for future ubiquitous and mobile computing research raised by the findings of a digitally expanded psychogeographical arts practice?'

In presenting my findings, I draw from the theory of relatability (Dzakiria, 2012), developed in the field of education. My aim is not to generalise but rather to provide a contextualised understanding of my research findings in a way that extends the power to generalise to readers or other researchers. I feel this is important because my research straddles multiple disciplinary domains which have different approaches to the validity and reliability of knowledge. By presenting my findings I hope to leave open the possibility of generalising and making generalisations to the readers who will have a better grasp of their own research context. I feel that my findings are relatable and offer insight to artists, cultural geographers and HCI researchers interested in the digitally expanded city.

7.2.1 Lexicon and Framework

Analysing the findings of all the drifts presented within this thesis, I drew on valuable theoretical and conceptual models of space, most notably non-representational theory (Thrift, 2008), Dourish's writings on ubicomp (Dourish and Bell, 2011), Deleuze and Guattari/ Manuel Delanda's virtual and actual ontology (Gilles Deleuze, 2013; Deleuze and Guattari, 1987; Deleuze, 2011; Deleuze, 2013; DeLanda, 2005), Henri Lefebvre's production of space (Lefebvre, 1991), Brian Massumi's writings on affect (Massumi, 2015) and Kitchin and Dodge's theory of CODE/SPACE (Kitchin and Dodge, 2011). Individually, none of these theoretical models provided the language to describe the emergent processes the experimental and interdisciplinary nature of my research unearthed. This required me to develop my own lexicon and framework. The particular framework and formulation I present below has emerged through a critical engagement with this literature, considered through the experience and reflective analysis of the four drifts that form my research. The framework describes the complex interaction of multiple abstract actors involved in the process, through which an individual understanding of space is collectively produced through social practice.

The combined findings of my drifts revealed three properties of space that were observed to be active in the way people form an understanding of space. I have named them actual space, virtual space and potential space. Each can be defined by their distinct qualities and the way they act within the world; however, they are not isolated from each other. Each of these three aspects of space can affect and be affected by the others. While the boundaries between these aspects of space can be defined, transformations in one can impact on the others. It is important to note that potential, virtual and actual space are not in opposition but are aspects of the production of space whose affective properties form complex feedback loops. Space is viewed as having two faces, the virtual and actual. The actual is physical, observable and navigable, whereas the virtual is an opaque force formed from a multiplicity of antagonisms, desires, personal and collective spatial narratives and affective experience. The virtual and actual are both considered to be fully real aspects of space. Potential space, on the other hand, is not real space. Potential space is a representation of real space. The process undergone by the possible is, therefore, a realisation. Potential space names the process through which the embedded logic of spatial representation is realised to transform the material reality of actual space or the patterns of thought, behaviour or organisation of virtual space.

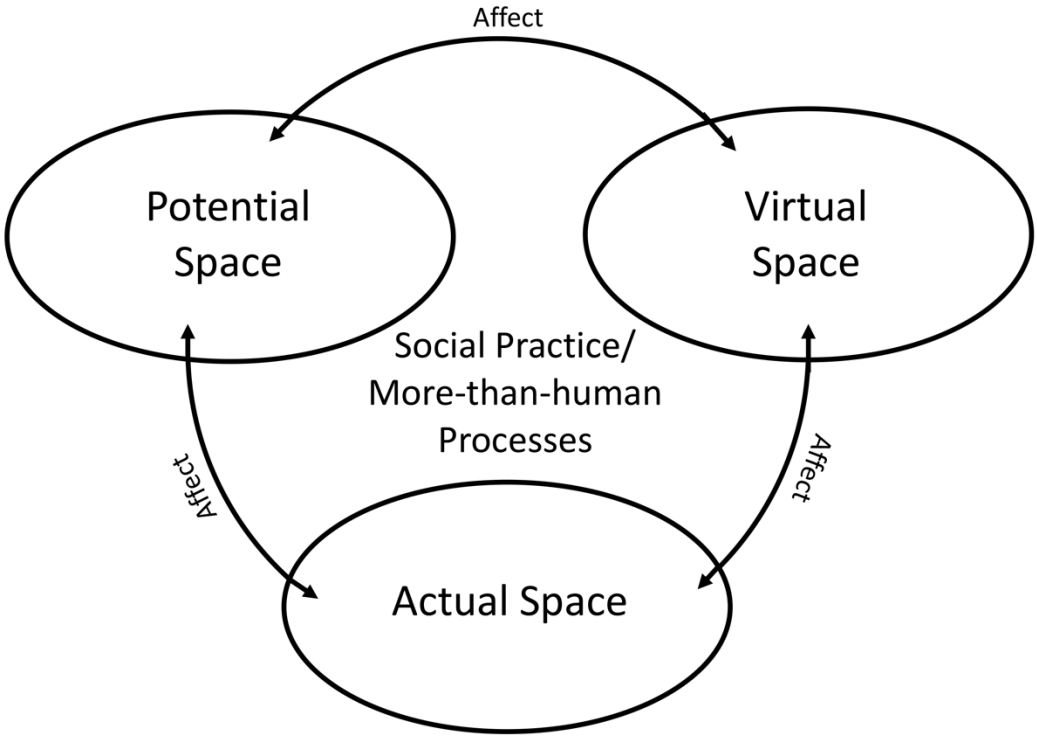

Figure 12 - Diagram of actors and processors involved in the production of the digitally expanded City

Recognising that change is a fundamental aspect of space, this framework takes an ontogenetic approach to the understanding of space. Ontogenesis is a philosophical term used to understand 'being' from the perspective of how things become. This is in opposition to the philosophical term ontology, which attempts to understand 'being' from a perspective of how things are. An ontogenetic approach asks 'what is the process through which an experience comes into being and what processes stabilise and destabilise that being?' This requires a shift in perspective from viewing objects in space to considering the properties and processes that interact to produce space. This includes social practices such as patterns of work and leisure, but it also includes more-than-human processes such as the transduction of space by code or the environmental impact of weather. This meta-model maps the ontogenetic processes and actants that were observed to play an important role in the production of space while participating in the four drifts. My research found that the space of East London is in a constant state of transformation, and that the motor of spatial change can be defined by a combination of social practice and more-than-human processes.

I will now look in more detail at each aspect of this model, describing the way they interact to produce understandings of space. I will conclude by presenting three examples taken from my research which demonstrate how this model relates to my psychogeographical practice.

7.2.1.1 Virtual space

I have defined virtual space as the subjective and intersubjective understanding of space. It names the active force formed from a multiplicity of antagonisms, desires, personal and collective spatial narratives and affective experience that have a very real impact on the space of the city. The virtual is an intensive quality acting on space without the agency of matter. Two aspects of the virtual were observed. The first was the virtual intensity of being affected by a site. These are the pre-rational feelings that emerge from an encounter; they can influence how an individual or group responds to a location – for example, the way the group stopped without speaking to each other at the intersection of Broadway Market and Benjamin Close. Virtual intensities are sensible understandings of space which are felt rather than conceived. Virtual intensities describe pre-rational affective and psychological responses to a particular location. They are non-representational experiences.

The second was the virtual ideas, such as memory or spatial narratives, which have the potential to inspire action. Virtual ideas name the embodied representations of space that individuals use to make sense of the city, such as memories, beliefs, narratives and spatial imaginaries. The Invisible Geographies drift observed the way virtual intensities, such as the felt experience of data centres, flow into virtual ideas forming spatial imaginaries. In this respect virtual space recognises a dialogue between non-representational experience and embodied representation, between the perceived that becomes conceived.

Virtual space describes personal embodied understandings of space. However, virtual space is not purely individual. My personal memory of the Samuel Pepys public house, described in Chapter 4, is my virtual space of that location. It plays a significant role in how I personally understand this site, even though the actual physical location has been completely transformed. Virtual space adds a temporal quality to space. The repetition of the past in the present through memory recall furnishes locations with personal psychic contours. Someone's understanding of space can be described as a virtual space; however, virtual space is not restricted to personal consciousness. It also includes social and cultural understandings of space. The telling of personal memories became an important aspect of the collective storytelling which provided key sites with social meaning. For example, the Hackney Drift observed the emergence of a collective understanding of space that helped to establish the participants as a group, through the telling of personal stories and the mythologising of key sites along the walk. The collective storytelling, politicising and mythologising produced a collective psychic geography that overlaid the physical space of the Hackney Drift. Virtual

space also includes the symbolic meaning found within a landscape, such as the signs and symbols used to communicate meaning within the urban environment: for example, the 'A.C.A.B.' (See Chapter 4, performance writing) graffiti found at various locations along the Hackney Drift or the shoes hanging from a telegraph wire used to advertise drug sales outside the Wayman Court estate.

Virtual space is a person's representation of a given space: an understanding that is not fixed, and that is open to change. The virtual, understood in this context, is not a simulation of the world, as in virtual reality, but an integral and active aspect of reality. It is embodied by the inhabitants of the city and describes the intersubjective flow between people. Virtual space resides in multiple interlocking layers, some more reachable than others. Virtual space is fully real insofar as it is virtual.

The Hackney Drift found that the use of mobile phones to research particular locations while participating in the drift did not constitute a separate digital space. The information that emerged from phone use entered the general conversations and awareness of the drift. Virtual space does not describe a different digital dimension of space. Virtual space recognises that contemporary subjectivities cannot be separated from digital processes. Virtual space attempts to grasp the complexity of personal and social processes of spatialisation that forms the context within which ubicomp and mobile computing intervene. Virtual space requires a breaking down of the binary between the digital and the physical, accepting that the world of physical space and the digitally mediated world do not exist as somehow two separate layers. The virtual space of ubiquitous and mobile computing is the spatial understanding that arises through social practices that engage with technologies such as mobile phones, but also the aesthetic experiences and spatial imaginaries that arise from their infrastructure's presence within the city.

The Manvers Main Digital Drift, which used Google Maps as the site for a digital drift, revealed that the particular form of digital representation, its potential space, contributes to the formation of virtual space; however, this formation was a complex interaction between its digital representation and the spatial understanding that emerged from its use. The Searching for the Cloud drift exposed a process through which the materiality of the digital infrastructure had an affective impact on the walkers, which flowed into the reflective production of spatial imaginaries. What was significant about the two infrastructural drifts was that most of the participants did not start with an already formed virtual understanding of these technologies and environments, and as a result were more open to speculating and being

imaginative in the way they understood these spaces. Digital technologies do not create their own space. They are entangled in a broader understanding of urban space.

The city as experienced from the perspective of the virtual is a coherent physical space belying a multiplicity of affective zones, desires, memories, stories, myths, signs, symbols, hopes, fears and conflicts. The virtual, understood in this way, enables it to become a device to describe the complex web of subjective and intersubjective forces that form spatial subjectivities. It is also an energy or force that can become actualised, transforming the material nature of the city.

7.2.1.2 Actual Space

I have defined actual space as the material reality of space: that is, the matter that forms the world and the bodies within in it that exists beyond perception or observation and is in a constant process of change. It is the concrete, stone, water and air that provide a space with its irreducible existence. Actual space is the form upon which social reality is constructed. It is the physical terrain within which social and/or digital interactions take place, but actual space is not a passive backdrop.

The actual space of ubiquitous and mobile computing is the material reality of its infrastructure, including mobile phones and phone masts but also data centres and the networks of fibre-optic cables or electromagnetic signals that are not available to perception. Actual space should not be viewed as a passive substrate, or the background to social interaction. The materiality of actual space, its sheer physicality and sensorial nature, manifests affective capacities and affordances which act as potentials in the social production of an understanding of space. Actual space is as much an active participant in comprising and shaping the virtual and potential aspects of a space as they are themselves productive and generative of spatiality. It was the changing landscape of Hackney, the disappearances and transformations of buildings, that prompted the telling of stories and the memorialising of certain key sites in the landscape. The impact of the material environment was most pronounced on the Searching for the Cloud and the Invisible Geographies drifts. Both of these events presented the participants with an unfamiliar spatial environment. The Invisible Geographies drift exposed the participants to the aural texture of the signals used by digital technologies to communicate. The Searching for the Cloud drift confronted the environments and buildings that house cloud services. These drifts revealed that the specific materiality of these experiences afforded different aesthetic experiences. The material environment is affective, and the experience of being affected flows into the formation of spatial imaginaries. We can say that actual space can become a virtual space. The affective qualities of actual

space produce new virtual spaces as it becomes representation through memory, spatial narrative and new understandings of space.

All four drifts found that the material reality of space is in a constant state of production and reproduction. Gentrification emerged repeatedly as an important process of change within East London, exemplified by Broadway Market. The Manvers Digital Drift presented a former industrial landscape in transition and the two infrastructure drifts exposed the constant production and repair of digital infrastructure: for example, Ciaran's rerouting of internet servers, or the construction of new phone masts in the upgrade from 4G mobile to 5G. The actual space of East London is in a constant process of transformation.

It is important to emphasise that the use of the word 'actual' does not make actual space any more real than virtual space.

7.2.1.3 Potential Space

Potential space is an attempt to rethink digital representation from an ontogenetic perspective. It approaches representation from the perspective of what it does in the world. Digital representations are not hylomorphic, imposing a predefined form onto matter. They are contextual and relational. Potential space understands representation as a form that mediates between the situated practices of their producers and the situated practices of the use. Digital representations carry the embedded conceptual logic of the situated context of their production into the situated context within which they function. An example of potential space from my research is Google Maps' corporate constellation of multinational chains, such as Tesco, Subway, KFC and Costa Coffee, which its cartography overlays onto the Manvers landscape. Google's cartography is a product of its corporate advertising strategy. However, their use of significant landmarks within Google Maps transmits the advertising logic of Google Maps' production into the logic of the maps' use and carries the potential for the multinational chains to become significant local landmarks, altering how people think about and understand this landscape. Spatial representation is therefore understood as having the potential to become real through social practice. In contrast to actual and virtual space, which are both fully real, potential space is not real space. Potential space is a representation of real space. The process undergone by possible space is, therefore, a realisation. Potential space names the process through which the embodied logic of spatial representations is realised to transform the material reality of actual space or the patterns of thought, behaviour or organisation of virtual space.

My thesis argues that spatial representation should be viewed as an essential, problematic and active logic in the process of spatialisation. I argue that spatial representation should be understood from an ontogenetic perspective as a potential space. My thesis defines potential space as the embedded logic of the domain of its creation carried by representation into the context of its use, where it functions as an attractor for patterns of thought, behaviour and organisation through human and more-than-human processes.

Digital representational practices are fundamental to the functioning of computers, which create abstract models of the world in code. Digital technologies are fundamentally representational (Dourish, 2011. p. 195). Ubicomp technologies, for example, focus on representations of the objects and activities of everyday life. I have included more-than-human processes as I feel the concept of potential space is relatable to contexts beyond mapping that employ less overt digital representational practices embedded in code or algorithms that transduce space.

7.2.1.4 Affect

Within my thesis, 'affect' is defined as the ability to affect and be affected. It is always between at least two bodies acting upon each other. It can therefore never be fully articulated from the singular perspective of one of those bodies. It always resides in between bodies. It has become an important feature of my thesis in that it defines the internal circuits of exchange between virtual, actual and potential space. For example, the experience of being affected by the materiality of a site is the affect of actual space on virtual space, and vice versa. A practical example is a way the particular architecture of the Telecity campus created a sense of unease and the feeling of being watched. The architecture is the site's actual space. The feelings of anxiety and unease are part of the site's virtual space. Affect is the relation between the two. Affect emphasises that the three spatial actors I have identified as active in producing the digital space of East London are relational, and impact on each other in complex ways. Each can be identified by its own distinct properties, but each can affect and be affected by the other.

Affect is often discussed as emotion; this is particularly prominent in affective computing. In my thesis affect is not an emotion, although being affected may lead to a display of emotion. Affect as a relation is not mind-dependent. For example, the actual space of a location can affect the location's representation without the involvement of human consciousness. Google Street View exemplifies this possibility. Google Street View images are created using a combination of car-mounted cameras and a light detection and ranging (LiDAR) scanner. This is an automated process through which the streets are abstracted into a set of data points

in space called a point cloud to produce the potential space of Google Street View, which in turn can affect the actual streets and the virtual understanding of the streets.

7.2.1.5 Social Practice/more-than-human process

Social practice and more-than-human processes describe the activities that keep the urban environment in a constant state of construction. Social practices are the daily routines of work and leisure. They are the way people make use of the space of the city and how they use technologies within these practices – for example, how people use Google Maps to navigate the city or make use of wi-fi to enable them to work in cafés. More-than-human processes describes non-human processes that transform space – for example, the weather or code-based automation. A simple example of a more-than-human process is smart traffic lights that regulate and control the flow of traffic through the city. Such automation has a direct technical impact on the flow of traffic, but also an aesthetic impact on the ambience of the city. While social practices such as changing working patterns were important to the production of East London, so were the more-than-human processes: for example, the invisible network of machine-to-machine communication that the Invisible Geographies drift uncovered.

There can be no movement between virtual, actual and potential space, and therefore no change without social practices and more-than-human processes. They transform and bring together the interlocking circuits between the virtual, actual and potential to produce space.

7.2.1.6 An Event

An event is the contextual bringing together of the different domains, virtual, actual or potential, through social practice or more-than-human processes. An event is the moment that change happens.

Within my thesis, this is the performative event of psychogeography. It is the disrupting of the routine habits of everyday life, enabling the urban experience to be viewed from a different perspective. An event is the moment that an individual's understanding of a site is disrupted, creating the possibility of a new understanding of the site to develop. It is a creative process that disrupts the fixity of the user's mental representation of space. An example from my thesis is the way Finsbury Park was understood before and after the Invisible Geographies drift. The drift exposed the participants to the spatial properties of the usually invisible network of wireless communications. After the drift, participants reported understanding the park as overlaid with invisible lines of data transmissions.

The moment of bringing competing spatial domains together can be shown to instigate a transformation in spatial understanding.

7.2.1.7 Space

A space, in this framework, is considered to be the totality of all a location's spatial relations (actual, virtual and potential) in a perpetual state of mutual becoming through social practice or more-than-human processes.

7.2.1.8 Examples

I will illustrate the model's use through three examples from my research.

1) Virtual space and Actual space

In Chapter 4, I provide a detailed account of the Hackney Drift and the significant role the Samuel Pepys public house played in anchoring the drift to Hackney's radical history. At the time of the drift the Samuel Pepys had been closed and the building had been gutted and redeveloped. As we waited for people to arrive my memories combined with the stories of other participants to mythologise and memorialise this location for the participants who had no personal experience of the Samuel Pepys. At the time of the Hackney Drift, the former public house was open as a pop-up café. Its physical structure had been radically transformed from that of the mythologised pub. This event illustrates the relationship between virtual space and actual space. The actual space of the Samuel Pepys was at odds with the stories and memories that form the site's virtual space. The location of the former Samuel Pepys must be understood from the twin perspectives of its current actual space and its socially produced subjective and intersubjective virtual space. The process of overlaying the actual space with the virtual space of collective storytelling did productive work. It helped to forge social relations between the walkers and with this location. It did political work in that the storytelling signified an opposition to gentrification, but it also produced affective qualities I would describe as a nostalgic mood amongst the participants.

2) Potential space and Virtual space

The Manvers Main Digital Drift, described in Chapter 6, focused on the digital representation of the Manvers area of South Yorkshire. This is an area I knew in the late 1980s and early 1990s. I, therefore, have a developed virtual space of the Manvers area. I haven't returned to this area since the 1990s. The Manvers Main Digital Drift brought the former derelict pit and slag heaps that form my virtual space of this area into conflict with the potential space of

Google Satellite View. Satellite View represents the area from above as a lake surrounded by a nature reserve. Google's representation transformed my understanding of the area. My virtual space was brought into conflict with the potential space of Google Maps, disrupting my understanding of the area and resulting in a transformed virtual space. Google's digital representation, its potential space, had a direct impact on how I understood the Manvers area after the digital drift. While this may describe a mundane example of how digital representations can change how people understand and know an area, it also has political implications. Google's representations are not neutral, and introduce an ideological frame rooted in the political and economic context of its production.

3) **Actual space, Virtual space and Potential space**

In this final example, I will explore the relationship between actual space, virtual space and potential space. In Chapter 5, I described the Searching for the Cloud drift. A key location on the drift was the Telecity and Global Switch campus. The actual space of digital infrastructure is its materiality. The actual space of the Telecity and Global Switch campus was the materiality of its architecture. The Telecity and Global Switch campus produce a hostile, securitised ambience. Being affected by digital infrastructure inspires subjective and intersubjective spatial imagination to emerge. Experiencing the materiality of digital infrastructure in new and unexpected ways inspired new spatial imaginaries. The virtual space of ubiquitous and mobile computing is the spatial imaginaries that arise through walking these spaces. If the actual space of digital infrastructure is its materiality, then being affected by the aesthetics of actual space inspired new spatial imaginaries to emerge: new virtual space. After the drift, Laura Grace Ford responded to the Searching for the Cloud drift through a piece of writing. The writing is a representation of the space. It is a potential space that has the possibility of altering how its readers understand and think about this area.

In this example, the affordances of the actual space of the data centre played an active role in inspiring a new virtual space, which became the source material for the production of potential space.

7.2.1.9 Summary

I have presented a meta-model that brings together the combined findings of my research. The model takes an ontogenetic approach to city space, recognising that it is in a constant state of construction and deconstruction driven by social practices and more-than-human processes. The meta-model presents city space as the mutual co-constitution of its materiality, the embodied psychic/social world of its inhabitancy and the logic embedded in

representational practices. I have named the key actors observed to co-constitute the digitally expanded city as actual space, virtual space and potential space. The model recognises affect as a relation between these key actors. One aspect of space can affect and be affected by other aspects of space. The digital does not define a separate space. The digital is implicated in all aspects of city space, from the functional logic of digital representations and the materiality of devices and infrastructure to the felt rhythms and ambience of everyday life.

The meta-model maps the actors and process of spatial production observed within the context of the psychogeographically-inspired performance events presented within this thesis. It does not claim to be a universal theory of the production of space. It recognises that other contexts may require different conceptual frameworks; however, I do feel that my model and lexicon is relatable to a wider body of research interested in digital spatial production.

7.2.2 Digital Geography of East London

My research was situated in East London. It defined a radial territory centred on Hackney Town Hall, reaching north to Finsbury Park and south to include the Isle of Dogs, west to Old Street roundabout and bounded in the East by the A12. Four drifts were carried out, exploring this territory from different perspectives. Each drift explored a different aspect of ubiquitous and mobile computing technology's spatial impact on the experience of East London. The Hackney Drift exposed that digital technologies are often intentionally designed to be invisible or transparent within the built environment. New experimental approaches to psychogeography were developed to explore the emergent digital aspects of East London. The combination of all the drifts revealed a territory in change and a territory in which ubiquitous and mobile computing plays an active but often opaque role in that change. My thesis found that ubiquitous and mobile computing plays an important role in how the space of East London was experienced; however, digital technology did not define a separate digital field of space. East London was found to be already digitally inscribed by, but not reducible to, digital systems. My thesis, therefore, argues that the study of the spatial impact of ubiquitous and mobile computing should not be separated from the complexity of everyday life in the city. In this section, I will contribute a brief overview of the digital geography of East London viewed from the combined perspective of my psychogeographically-inspired arts practice. This summary exposes the geography in which human geographies of affect, memory and economics are entangled with more-than-human geographies of machine-to-machine interaction and the materiality of infrastructure.

The changing nature of East London, and particularly the process of gentrification, was an inescapable backdrop to all the drifts carried out as part of my research. Gentrification is 'the

transformation of a working-class or vacant area of the central city to a middle class residential and/or commercial use' (Glass, 1964). Gentrification was not a primary focus of the drifts, and I have not analysed it at any level within this thesis; however, it is impossible to collectively walk East London without recognising its impact. Gentrification played a role most explicitly in how the Hackney Drift was experienced and understood by the walkers, but it was also a significant backdrop to the Searching for the Cloud drift and the Limehouse Invisible Geographies drift. The Searching for the Cloud drift concluded in The George pub, which was the former meeting place of East London dock workers and is itself in the process of being transformed into a gastropub. The Limehouse Invisible Geographies drift explored the signals and transmissions of mobile and ubiquitous computing around the Robin Hood Gardens estate, half of which has now been demolished to make way for luxury flats. The changing nature of the landscape, the disappearance and the construction of new buildings, emphasised the dynamic nature of East London at the time of the drifts. It also emphasised the importance of viewing space not as a fixed quality but as being in a constant process of production and reproduction.

The process of change and transformation presented itself as a fundamental aspect of East London, but it also revealed the importance of memory and storytelling. Collective drifting in East London presented a territory overlaid with ghosts and potentials, personal and collective memories, that continue to be felt in the present even if the physical sites and structures they belong to have been erased. Official narratives of space came up against stories, narratives and myths that unite and form groups around particular sites in the landscape. The Samuel Pepys pub played this mythological role for the former counter-cultural members of the Hackney Drift. East London could be seen to contain a geography of competing and conflicting major and minor narratives, spatial stories anchored by key sites. Mobile and ubiquitous computing play an active role in spatial storytelling (Farman, 2015). Rather than creating an alternative digital sphere, the use of mobile technologies makes the sharing of spatial narratives more prolific. This was exemplified by the way mobile phones were used by drift participants to document and share their experiences of the drift and also in the way mobile phones were used to research particular buildings and locations. The speculation that the strange geography of Broadway Market and Welshpool Street was the site of a World War Two bomb was easily confirmed using a mobile phone. The quantity of spatial information available by mobile internet use intensifies the proliferation of spatial narratives. Mobile technology can be seen as providing access to an archive of spatial narratives which adds to the circulation of spatial stories. Mobile technology becomes a carrier of spatial storytelling, a two-way interaction between researching sites and documenting them. Spatial narratives live on within the digital domain, ready to be activated in the physical domain,

while spatial experiences are documented and shared from the physical domain and become part of the digital. Digital representations of space play an important role in producing the space of a territory. My research included a study into the representational practices of Google Maps, currently the most widely used digital mapping system. Google Maps imports into a territory a very specific cultural and ideological representation of space, one that is rooted in the commercial interests and worldview of its developers. It also allows a transgression of space, linking disparate sites and locations. The Manvers Digital Drift imported the geography and stories of the Manvers area of South Yorkshire into the space of a disused shop in Old Street, Hackney.

One important feature revealed by the East London psychogeographical drifts was a geography of interlocking and intertwining affective zones. The drifts documented clearly defined areas of felt experience. In the early writings on psychogeography, Debord wrote: 'From a dérive point of view cities have psychogeographical contours, with constant currents, fixed points and vortexes that strongly discourage entry into or exit from certain zones' (Debord, 1958, p.2015). The extended practices of the drifts presented within this thesis found areas of strongly felt experience, shifts in the background ambience of East London that made us stop in our tracks or spontaneously quicken our pace, unspoken responses to changes in the environment that spread through the walkers. East London was perceived to contain a geography of affective zones. Affective zones are marked by aesthetic experiences linked to the specific material and social construction of a site. Affective zones were an observed feature of all the drifts, but the Searching for the Cloud drift exposed the most sharply felt contrasts between locations and areas. This was particularly strong in the areas of East London that house data centres. Here the infrastructure of ubiquitous and mobile computing has a direct impact on how East London is experienced. In Chapter 5, I described in depth the way the Telecity and Global Switch campuses conspire to create an ambience of surveillance and paranoia, a tense atmosphere of hostility. The Equinix L8 data centre, by contrast, creates an altogether different ambience. Equinix L8, sited at Harbour Exchange, shares the strategy of anonymity with the Telecity and Global Switch campuses, but the ambience it creates is different. Equinix L8 is located in a building constructed from square deep-blue mirrored windows. The reflection of clouds in the blue glass creates a techno-spiritual aesthetic that functions to camouflage the data centre. Affective zones were linked to the materiality of sites. Materiality was shown to afford aesthetic experience that inspires poetic imaginaries, fantasies and desires.

The presence of clusters of hidden data centres in East London revealed another invisible geography, the linking of the data centres by a network of lit and dark fibres running under

the streets. This network connects multiple local networks to global locations. East London is simultaneously local and situated, but also internationally connected, and these dynamics structure the impact of the data centres on the local area. The meeting with Ciaran, the data centre technician, highlighted an internal geography within the centres that is structured by international politics and local regulation.

A machinistic geography of signals and transmission was revealed by employing RF receivers to the two Invisible Geographies drifts. From this perspective, East London was experienced as overlaid with a complex network of signals and data transmissions. This was never intended to be a human geography. In this space, digital devices carry out their own interactions: machines talk to machines. Mobile phones regularly send signals to phone masts, pinging their presence and checking in to new towers as we move. Satellites are contacted, a minimum of three to triangulate a GPS location. Wi-fi networks are joined and Bluetooth data shared. Human interactions are only a small percentage of this network of technological communications, but these invisible geographies are implicated in wider processes of restructuring. The availability of fast wi-fi facilitated the adoption of Broadway Market cafés as workspaces for information workers, changing the nature of the street and the area.

The geography mapped by the four drifts presented a complex meshwork of human and non-human interaction, affective zones formed from the materiality of digital infrastructure, imagination and fantasy inspired by the strange sounds and spatial properties of data signals, new myths and desires colliding with economic spatial restructuring and a sense of nostalgic loss, machines talking to machines and digital representations of blurry-faced residents of a permanently sunny landscape with a Google logo watermark. This is a psychogeographical mapping of East London viewed as a territory where digital technologies have woven themselves into the fabric of everyday life.

7.2.3 What Kinds of Knowledge Do Psychogeographical Art Practices Produce?

Central to my research has been my interpretation and extension of psychogeography. Psychogeography was chosen because of the perceived possibility that its practices could bring the complexity of the embodied, culturally and socially situated experience of the city into spatial research. The experience of carrying out the four psychogeographically-inspired drifts described in this thesis has given me a good insight into the strengths and weaknesses of psychogeography as a source of spatial research. I will provide a summary of the kind of knowledge my psychogeographically-inspired performance practice produced and conclude by exploring its implications for ubiquitous and mobile computing research.

The core strength of psychogeography, as a source of research, is its strategy of defamiliarisation combined with its group dynamic. Focusing walkers' attention on the everyday that is usually overlooked by the habitual nature of city life was central to the Situationist engagement with the drift. As Hart (2004) notes, one of the fundamental strategies invoked by psychogeography is to carry out a performative estrangement from the mundane everyday – to uproot the walker from their predicted paths and jolt them into a new awareness. My extension of psychogeography to focus on the digitally expanded city placed this strategy at its heart. Each drift was designed to destabilise existing understandings of the city by focusing on specific digital aspects, allowing alternative understandings to emerge. Each drift was an act of estrangement that moved the participants beyond their everyday understanding of the city, making the familiar unfamiliar and in doing so exposed the processes and practices involved in constructing and reconstructing their understanding of space. The practice of psychogeography is social and collaborative. Walks are never carried out alone. The participatory nature of the psychogeographic drift reveals the social dynamics through which this process takes place. It therefore opens up the opportunity for a researcher to become an observant participant in the social dynamic through which participants' understanding of space are destabilised and new spatial understandings emerge. This is invaluable for researching spatial production from an ontogenetic perspective of a city's becoming.

My thesis argues that the fundamental knowledge psychogeography reveals is the social process through which spatial knowledge is produced. This aspect of psychogeography enables research to shift from a fixed representational view of cities and those who inhabit them towards the social processes through which spatial understandings are produced. It views cities as socially produced in practice, maintaining the rich human and affective context. This thesis argues that the main strategy of psychogeography is the performative spatial estrangement of a group of participants, and this strategy can be extended to digital aspects of the city. My research maintained the strategy of estrangement and the social nature of the event even when it moved away from walking city space and focused its technique on Google Maps. Its effectiveness in this context suggests that an extended psychogeography could be used as a research tool within a wider set of digital spatial contexts.

Psychogeographically-inspired performance practices have some important limitations for understanding the digitally expanded city. The main limitation is that they are not suited to gaining precise data on the functioning of digital technologies, infrastructure or the algorithms that underscore representational logic. Psychogeography is the study of the geographical environment's influence on the mind or behaviour. Therefore its research focus

is not on a correct technical understanding of the digitally expanded city; rather, it is an attempt to research how people socially construct an understanding of the digitally expanded city. Psychogeography inspires the production of new spatial imaginaries. This is particularly true when the participants do not already have deeply entrenched knowledge, memories or social narratives associated with a space – for example, exploring the locations of East London's data centres or the more-than-human geographies of data transmissions. However, the spatial imagination that arises from these experiments, while highlighting the usually overlooked digital aspects of the city, is unlikely to produce precise technical knowledge.

My research found that psychogeography exposes two distinct forms of spatial knowledge. The first is the embodied sensible knowledge of being affected by the environment and the bodies within it. This is the aesthetic bodily response to the digitally expanded city. I argue that this makes psychogeographical performance practices ideal for studying affect, either from a cultural geography perspective or from a ubiquitous and mobile computing perspective. The second form of spatial knowledge psychogeography produces is the embodied representations that emerge through memory and spatial narratives. The experience of the drifts found that rather than understanding memory and spatial narratives as fixed representations, they were observed to play a productive role in how the participants socially produced personal and collective relations to sites within the digitally expanded city. The drift is a valuable tool for researching city space from a perspective that brings the past and the future together into the present. Walking the city, participants recount past experiences but also speculate about future possibilities. I argue that both speculative imagination and spatial narratives function as productive forces in the production of spatial understandings. Such narratives function to disrupt or maintain spatial relations and expose situated spatial politics. The Hackney Drift revealed the way dominant spatial narratives come into conflict with the minor spatial narratives of cultural subgroups within the city. The spatial narratives that arise from walking the city present a research opportunity for understanding the situated minor and major spatial politics of an area. This area of research is particularly useful for researchers interested in locative media and mobile storytelling.

Affect and embodied representation describe two different forms of knowing; however, my research found that they are intertwined, and influence each other. Put more succinctly, my research found that being affected by a site flowed into how the site is represented. Conversely, the history of a site can produce affective responses. The two studies on digital infrastructure found that while affect cannot be articulated from a singular perspective there was a direct link between being affected by a site and the development of a spatial imaginary.

Psychogeography does not just focus on understanding the city as it is. It actively engages in producing the city, both through the performative event of the drift and through secondary representations such as texts, images, maps and sound. The active engagement of psychogeography in producing the city opens up research opportunities to explore how new spatial imaginaries form and the productive possibilities of psychogeographical narratives.

One of the key features of the digitally expanded city is the active presence but invisible nature of digital technology. Extending the drift to focus specifically on digital aspects of the city help to make the participants aware of the usually hidden digital technologies that are active in the city. This was particularly true of the Invisible Geographies drift that enabled the participants to start to think about the geographies that are unique to digital technology, exposing them to the particular texture of data communications. A digitally extended psychogeographical performance practice made the more-than-human geographies of digital technology knowable as an actant in spatial production. I argue that exposing the usually hidden qualities of digital technology allows participants to start to rethink the city, producing new imaginaries and bringing hidden technologies into wider critical discourse. I found that a psychogeographical art practice is ideally suited to be extended to engage with and research the more-than-human geographies produced by digital technology.

From the experience of the four drift, I would like to highlight some best practice for carrying out research using psychogeographical walking techniques. The number of participants makes a big difference. When the number of participants becomes greater than five, it becomes difficult to gain much more than a partial overview of an event. A typical dynamic I have observed is that when walking between locations, the drift breaks into smaller groups, often twos and threes. They then form a single group at key locations. For groups more than five I recommend using more than one researcher with a sound recorder. Any additional researcher should be trained to be aware of affective experience and be able to report their findings.

Introducing digital elements into the drift, such as the Manvers digital drift or the Invisible Geographies drift, alter the walking dynamic. The researcher has to take this into account. The screen-based nature of the Manvers digital drift created a secondary layer of participants who watched but did not actively collaborate in the event. The Invisible Geographies drift was performed twice. The different contexts altered how people responded. The first Invisible Geographies drift walked from Limehouse Sailer's mission to the Robinhood gardens estate. The participants stayed together as a group until that arrived at Robinhood gardens where they broke into smaller groups. The Finsbury Park drift had no direction. The participants split up into small groups and walk in different directions. This made it difficult for me as a

participant and researcher. What I have found useful is to give some guidance at the start of the drift. A rough destination or rout is useful and then allow the collaborative nature of the drift to take over. This strategy avoids the two dangers of either leaving inexperienced walkers not knowing what to do or overprescribing the event cutting down on the collaborative and serendipitous strength of the drift.

From the perspective of best practice, I recommend using one researcher per five participants. The organiser should set up the initial drift context, giving it some direction while remaining open to allow the drift to develop its own dynamic. Finally, the social dynamic is an essential aspect of psychogeography. When introducing digital aspects to the drift, such as the RF receivers, the participants must not be isolated from each other by headphones or screens.

In summary, a psychogeographical art practice produces knowledge about the process through which space is socially produced. This includes affective experience of city space and the memories and cultural narratives that form relations between inhabitants and spatial sites. Psychogeography is not restricted to what is already known. Its practices actively engage in producing the city, both through the emergence of new spatial imaginaries that result from participating in drifts and through the texts, images, sounds and artefacts that are produced in response to walking the city. The engagement of psychogeographical performance practices in producing spatial understandings offers many opportunities for researchers interested in space as a process. Extending psychogeography to focus on digital aspects of the city showed that it can be extended to include the digital and reveal an invisible more-than-human geography.

I will now explore how the findings of this thesis can contribute to debates within art practice, followed by ubiquitous and mobile computing research.

7.2.3.1 Implications for art practice

This section contributes to fine art performance practices and in particular those influenced by psychogeography. To speak of psychogeography in the singular is misleading. Psychogeography names a disparate set of often conflicting ideas and practices. Psychogeography's lack of fixity is perhaps the root of its enduring influence on art and activism. Under its sign drift, neo-situationists who claim a dogmatic adherence to the writings of the Situationist International, anti-gentrification activists for whom walking in the city has once more become a political act, neo-romantics, whose ramblings take on a hallucinatory poetic form, the followers of occult lines of influence through city space, essay based filmmakers such as Patrick Keeler or Christopher Petit, walking artists with an interest

in site specificity and the makers of a variety of locative new media art projects. Taking influence from this fractured but energetic field of activity, my research contributes to both psychogeography and performance practice. It presents an experimental form of performance practice and a new focus on the digital within psychogeography.

My art practice contributes to discussions within fine art performance through the development of the strategy of feral performance. Feral performance is the blurring of performance and everyday life using transmedia storytelling. Feral performance was used within this research through CODED GEOMETRY, a fictional political organisation which was developed as a performance strategy to enable the development of a digital psychogeographic practice, the organisation of events and the fictioning of East London. Feral performance takes place outside of the traditional art world, making use of self-organisational and DIY techniques borrowed from activist organising strategies to bring into being alternative publics, practices, discourse and futures.

My practice extended psychogeography through centring the digital as a key area of interest in psychogeographic practice. While locative media has expanded psychogeography (Pinder, 2008) to explore the relationship between digital content and physical space, my practice moves beyond this dualism in favour of a view of the digital as a fully integrated aspect of contemporary life. My practice builds upon psychogeography both philosophically and practically. Philosophically it highlights the very subtle impact of the digital on the production of space which plays a role in even the most analogue practice of contemporary drifting. While exposing the subtle impact of the digital, I have extended psychogeography to highlight space unique to the digital. Each drift presented within my thesis was developed to extend the technique of the drift to focus on machine-to-machine geographies of digital technology, the impact of digital infrastructure on the space of the city, and the possibility of carrying out virtual drifts. Underlying these performative expansions to practice is an attempt to develop a political project of resistance that is revelatory of the power and control that is rendered invisible through the impact of digitality. The original situationist practices of psychogeography recognised the relationship between power, control and the spatial atmospheres of everyday life. My thesis expands that understanding to seek out the occulted influence of the digital on the felt experience of urban space.

7.2.3.2 Implications for Ubiquitous and Mobile Computing Research

This section contributes to theoretical debates within ubiquitous and mobile computing research. It brings together several concerns that have emerged and have been integral to the findings of my research. The most prominent are a suggestion to move away from a spatial

model based on the concepts of 'space' and 'place', a call for ubiquitous and mobile computing research to consider the political and ethical implications of the concept of the 'invisible' which has become central to design thinking in ubicomp, and the suggestion that the spatiality created through the development of ubiquitous and mobile computing constitutes a new direction for research within HCI. These arguments were analysed in depth within the thesis in response to the context of the drifts. I will summarise the findings here.

The discourse around spatiality has played an important role in the growing discipline of mobile and ubiquitous computing. Weiser's foundational vision of ubicomp was articulated in spatial terms as a move away from the specialist spaces of computing and into the natural human environment. One of the most enduring conceptualisations of space within Human-Computer Interaction is that of 'space' and 'place' originally outlined by Harrison and Dourish (1996). They made a clear dichotomy between the two concepts of space and place. They defined space as follows: 'Space is the structure of the world; it is the three-dimensional environment in which objects and events occur, and in which they have relative position and direction.'(Harrison and Dourish, 1996) They contrast this definition of space with a definition of place, stating that

> Physically, a place is a space which is invested with understandings of behavioural appropriateness, cultural expectations, and so forth. We are located in "space", but we act in "place". Furthermore, "places" are spaces that are valued. The distinction is rather like that between a "house" and a "home"; a house might keep out the wind and the rain, but a home is where we live (Harrison and Dourish, 1996, p.).

This particular model of space has remained influential within HCI despite Dourish's (2006) updating of his concept of space to recognise that space is equally an outcome of social practice. More recently, Dourish has argued for an alternative model of space and spatiality to that which dominates current discourse in the design of ubicomp technologies and environments (Dourish, 2011, p. 108). Dourish writes:

> Ubicomp brings computation out of the traditional desktop and into the spaces beyond; but the critical feature of these spaces is that they are always and already populated and inhabited. More to the point, the experience of space is that of multiple infrastructures – infrastructures of naming, movement, interaction, and so on – and these infrastructures emerge from and are sustained by the embodied practices of the people who populate and inhabit the spaces in question. Spaces are not neutral, and their complex interpretative structure will frame the encounter with ubicomp; by the

> same token, the opportunities afforded by new technologies allow for a reinterpretation and reencounter with the meaning of space for its inhabitants. The experience of space is fundamentally coextensive with the cultural practice of everyday life (Dourish, 2011, p. 108).

Dourish argues for an alternative model that considers the physical reality of digital systems, the spatial nature of mobile services, and the cultural framing of space. While the framework and lexicon I have presented above emerged as a model for thinking about the key actors and processes involved in the production of space from the perspective of a fine arts performance practice, I feel that it is highly relatable to the context of ubicomp research outlined by Dourish. The model centres social practice around the interplay of virtual social meaning, the actual physicality of a city space that includes digital infrastructure, and the potential spaces brought into being through digital representational practices. I feel that, providing that the model I have outlined is amended and adopted to the specificity of any new context, it contributes a more complex thinking about the actors involved in the way ubicomp operates in the world and the new worlds ubicomp brings into being.

My research found that ubicomp contributes to the creation of new specialities through the processes, representations and materiality they bring to urban space. The examples explored in my research include the subjectivities formed through the digital representations embedded in Google Maps and the aesthetic affordances of ubicomp's infrastructure. My thesis argues for a new direction in ubicomp research that explores the spatial impact of ubiquitous and mobile computing. The main focus of research within ubicomp and mobile computing is currently the design and testing of new systems and technologies. My thesis argues for more attention to be paid to the geographies these technologies produce. Ubicomp is defined as computing in the context of everyday life. If ubicomp is to move away from viewing space as a passive backdrop for the implementation of technologies, then it has to take seriously the role of ubicomp in designing new spatial relations, new social practice and new ambience, and in extending what space is and what it can do. Such research should ask questions about how ubicomp impacts on and produces the wider space of the city, and what new ambiences this brings forth. Viewing ubiquitous and mobile computing as spatial producers offers new areas of design thinking, and I would argue that the critical walking practices of a digitally expanded psychogeography are well placed to research such an impact from a situated, collective and embodied perspective that brings together the complex social forces and affective experience involved in urban life.

My research contributes to theoretical discussions within ubicomp research around the concept of 'the invisible' (Heer and Khooshabeh, 2004; Farman, 2014) within HCI design literature. Invisibility is central to HCI design thinking. In Chapter 5, I outlined how an HCI-disciplinary reading of Heidegger's philosophy of equipment, specifically the concepts of 'ready-to-hand' and 'present-at-hand', is at the core of a digital infrastructural invisibility and the creation of 'black box' (Latour, 1999, p.304; Latour, 1987, p.2-3) technologies. Invisibility enables ubicomp technologies to be used without specialist knowledge and frees people from the complexity and cognitive load involved in understanding how these systems actually function. However, as ubicomp technologies are implemented within the fabric of everyday life, invisibility has a secondary political and ethical consequence. In the absence of an awareness of the role ubicomp plays within the environment, particularly concerning data gathering and surveillance, the residents of urban space are denied access to the wider discourse around these issues. It's here that psychogeographically-inspired performance practices can play a direct role within ubiquitous and mobile computing through their critical engagement with city space and in the form of radical pedagogy.

In their study of art, design, and performance in recent science and technology studies, Salter, Burri and Dumit (2017, p. 140) offer four ways that art practices can contribute to the study of technology:

> 1) The involvement of art and design in exploring both the production and stabilization of scientific facts and the development and use of technological artifacts and sociomaterial networks can generate other enriched forms of knowledge, which includes aesthetics, across all of the senses (Benschop, 2009).
> 2) STS (and science in general) could tap into enlarged methodological repertoires. Art and design works can thus counterbalance the more standard cognitive and social science approaches of STS by injecting ambiguity, complexity, speculation, and agonism when displaying and communicating science.
> 3) Art- and design-inspired ways of enacting and communicating research results can enable STS work to reach broader audiences than written scientific work, thus facilitating the inclusion of wider publics in the reflection on science and technology and contributing to its democratization.
> 4) Art and design interventions can be forms of radical political engagement with sociomaterial worlds and thus can participate in the shaping of technoworlds and the formation of technosocieties. Art and design methods might enable an alternative way for STS to get involved in sites where science and technology are constructed –

> experiments in codesign, participatory and adversarial design, and critical making are key in this respect. (Salter, Burri and Dumit, 2017, p. 140)

My thesis argues that providing it is not restricted, curtailed or tamed by the academic disciplinary conventions of computer science, a digitally expanded psychogeographically-inspired art practice has the potential to contribute to all four areas of engagement with ubiquitous and mobile research. For example, my research has shown how the participatory practices of exploring digital infrastructure generate forms of knowledge that include aesthetic experience across all of the senses and how such experiences can promote new spatial imaginaries capable of expanding spatial knowledge of urban space to include the usually inaccessible worlds of machine-to-machine communications or the architecture of infrastructure. Such engagement can extend public-facing science communication, raising critical and ethical questioning and critiquing the political formations of existing technologies promoting speculative alternative imaginaries. The aesthetic and playful experiments of a digitally expanded psychogeographical practice that places itself at the intersection of the city, the perceiving body and technology can produce outcomes that ask critical questions, expose problems and suggest speculative answers to research in the area of ubicomp.

In summary, my research contributes to ubiquitous and mobile computing design thinking by offering a complex model of spatial relations, a new direction in ubicomp research that focuses on the spaces technology co-produces and new knowledge of how a psychogeographically-inspired arts practice can contribute to the ongoing research in the area of ubicomp.

7.3 Summary of the contribution

This thesis asked the research question: What can a psychogeographical art practice reveal about the production of the digital expanded space in East London? A psychogeographically-inspired performance practice was developed to research these questions and it was approached from three different perspectives: 1) The production of spatial subjectivities, 2) the materiality of digital infrastructures and 3) digital representational practices. The combined findings of the research make three distinct contributions to knowledge.

The first is a framework and lexicon to rethink spatial production in the digitally expanded city. The framework presents an ontogenetic model of spatial production. It provides a lexicon of the actors and processes observed to play a role in producing space by psychogeography's strategy of collective defamiliarisation. While the model relates to the situated experience of the four drifts presented within this thesis, I feel it is relatable to a

wider body of research interested in digital cities. I feel that it has implications for researchers interested in fine art and performance studies, cultural geography and ubiquitous and mobile computing.

The second contribution presents a new understanding of the impact of ubiquitous and mobile computing on the experience of East London. The combination of the drifts, performance writing and analysis produces a psychogeographical mapping of East London. It charts the situated impact of digital technology on East London from the three perspectives of subjectivity and intersubjectivity, materiality and digital representation. Its experimental performance practices expose East London's unique more-than-human digital geography of electromagnetic data transmissions, underground fibre-optic cables and data centres. It presents East London as infused with digitality at every level. This geography contributes to an understanding of the invisible impact of digital technology in East London.

The third contributes to an understanding of the kinds of knowledge a psychogeographical art practice can produce. My literature review found that while there has been speculation, particularly in cultural geography and urban studies, about the potential presented by psychogeographically-inspired art practices for spatial research, no in-depth studies had been carried out into expanding its performance practices to the digitally expanded city. My thesis carried out four experiments that extended psychogeography to focus on digital aspects of East London. The findings of these studies contribute to and develop an understand of using psychogeographical art practice in a research context. They describe the kind of knowledge psychogeography can produce and highlights areas where its techniques are particularly appropriate. This contribution is significant for fine art and performance studies interested in developing future psychogeographical interventions, cultural geographies interested in areas of affect, spatial narratives, memory, more-than-human geographies and digital cities. It also provides several key areas where these findings contribute specifically to mobile and ubiquitous computing research.

In conclusion, this thesis makes three distinct contributions: 1) A framework and lexicon to rethink spatial production in the digitally expanded city; 1) A new understanding of the impact of ubiquitous and mobile computing on the experience of East London; 2) An understanding of the kinds of knowledge a psychogeographical arts practice can produce.

7.4 Future Work

Based on my experiences of using a digitally expanded psychogeography as the site of research, I can offer several suggestions for further refinements and direction for future work. Through carrying out my research I have felt a synergy develop between my research and practice as these distinct activities directly influence and impact each other. My research suggests new directions within my art practice and my art practice opens up new directions for research. The relationship between what I have defined as virtual, actual and potential space remain central to my plans for future work. The research presented in this thesis has revealed a number of important and interconnected areas that I feel require future investigation. These include; 1) The micro and macro impact of cloud computing, 2) artificial intelligence at the Edge, 3) the hauntology of technical objects, 4) an exploration of more-than-human spatialities , and 5) the creation of a digitally expanded game of psychogeography.

1) The Micro and Macro Impact of Cloud Computing

My research exploring digital infrastructure through the 'Searching for the Cloud' drift revealed the affective qualities of cloud computing infrastructure which goes beyond its technical function and plays an important role in constructing the aesthetics and poetics of key sites in East London. The experience of walking East London's data centres combined with our conversation with Ciaran, the data centre engineer, revealed two new related lines of enquiry, which were underexplored within my thesis, but I feel deserve more attention. Our confrontation with the physicality of the data centres exposed their integration into wider networks of infrastructure, in particular their use of electricity. Telehouse North Two, for example, contains its own on-campus 132 kV grid substation that is directly connected to the National Grid. Such heavy demands for electricity raise important questions about the environmental impact of cloud computing and also why so much data is being stored.

Data centres are implicated in a new form of extracting surplus value, one rooted in the social and spatial relationships between people. Zuboff, 2019, has exposed how data centres extract value from the surveillance and storage of personal behaviours, habits, beliefs, dreams and desires. Data is now one of the most valuable commodities with the Economist running a leader article in 2017 with the headline, 'The world's most valuable resource is no longer oil, but data'. (The Economist, 2017)

I feel that a digitally expanded psychogeography is well placed to map the complexity of data centre relations which intertwine the micro-extraction of surplus-value from personal data to the macro extraction of fossil fuels to power the mass storage of personal data in centralised data centres. Since the completion of my thesis, I have been developing this line of enquiry through a collaboration with the Royal College of Art Walkative Society. On Sunday 27th October 2019, I organised a 'Dark Fibre Network Drift' following the routes of underground fibre optic cables linking important aspects of East London's data infrastructures. The first drift was attended by around 40 participants.

2) Artificial Intelligence at the Edge

The value that can be extracted from storing large volumes of personal data lies in the ability to use advanced data analytics to recognise and predict patterns within big data. Zuboff argues that "analysing massive data sets began as a way to reduce uncertainty by discovering the probabilities of future patterns in the behavior of people and systems". (Zuboff, Möllers, et al., 2019) Central to spotting new patterns and predicting future behaviours is the science and technology of machine learning. Human experience is increasingly viewed as free raw material for translation into behavioural data. Zuboff, 2019, describes this process, 'Although some of these data are applied to product or service improvement, the rest are declared as a proprietary behavioral surplus, fed into advanced manufacturing processes known as "machine intelligence," and fabricated into prediction products that anticipate what you will do now, soon, and later. Finally, these prediction products are traded in a new kind of marketplace for behavioral predictions that I call behavioral futures markets'. New markets are emerging, driven by the desire to acquire ever-more-predictive sources of behavioural data, for example from our voices, personalities, and emotions. What has not yet been fully theorised is the way ubiquitous computing is increasingly combined with artificial intelligence, a process referred to as artificial intelligence at the edge, to collect and analyse situated behaviour. Zhou, Chen, et al., 2019, have highlighted that, 'As a key driver that boosts AI development, big data have recently gone through a radical shift of data source from the megascale cloud datacenters to the increasingly widespread end devices, e.g., mobile devices and Internet-of-Things (IoT) devices. Traditionally, big data, such as online shopping records, social media contents, and business informatics, were mainly born and stored at megascale datacenters. However, with the proliferation of mobile computing and IoT, the trend is reversing now'. Artificial Intelligence at the edge, refers to the embedding within the environment, devices that are able to sense their environment, learn from it and react on it. It describes the convergence of ubiquitous computing and machine learning with the aim of constructing a city architecture of 'intelligent' networked devices, things, and spaces. To

develop an understanding and critique these new developments, I feel it is important to embody these new technologies through engaging at the level of electronics and code. To research Artificial Intelligence at the edge through practice, I have been accepted onto a SPACE Art + Technology residency[33] which will run through 2020 and into 2021. I will use this funded period of research to develop speculative artworks using embedded artificial intelligence.

3) Hauntology of Technical Objects

My exploration of representation in Chapter 6 'Potential Space', focused on the friction between representations of space embedded within digital technology and the social practice through which personal understandings of space are produced. My analysis did not take into account the reverse process, through which social practices becomes represented within machine-to-machine digital processes. It can no longer be assumed that the production of space always involves an embodied human agent, and as artificial intelligence at the edge becomes more prevalent the role non-human machine agents play must be considered.

Whilst digital mapping technologies produce representations of space, the combination of ubiquitous computing and artificial intelligence produces representations of people and things within machine-to-machine communications that, like the technologies themselves, are no longer visible. A good example of this process is the use of a debit card for contactless payment. The card itself conceals a Proximity Integrated Circuit Card (PICC) that is activated by a simple swipe of the card over a reader, seamlessly connecting a series of distributed computer systems: for example, entering Hackney Central train station. PICCs produce representations of the occupants of the city through the data shadows their movements and financial transactions produce within computer systems. The technical objects involved in this process have their own histories, which raises important questions about what their histories recall and what theoretical frameworks, logics and representations they bring forth from those histories and reproduce in the present. Psychogeography has extensively engaged with hauntology. Inspired by Mark Fisher's appropriation of Derrida's concept of 'hauntology', psychogeographic hauntology seeks out the 'ghosts' within a particular place, the forgotten or hidden histories that continue to play a role within the present or the forgotten histories and alternative futures that are neither present nor absent within a site.

[33] See the SPACE Art + Technology website - https://spacestudios.org.uk/art-technology-index/ (Accessed 7,6,202)

My suggestion for future work is to extend hauntology to explore the embedded histories of more-than-human technical objects active in spatial production. A hauntology of technical objects would form the basis of philosophical engagement, exploring the ontological consequences of people becoming represented as things within machine-to-machine digital processes and the role these processes play in producing the space of East London. For example, a brief investigation into the everyday technology embedded in a debit card revealed that the enclosed Proximity Integrated Circuit Card has kinship with radar, computers, and Plutonium-239, and suggests a psychogeographical journey that leads, amongst other places, from London, via the Los Alamos National Laboratory, eventually to Bawdsey Manor on the Suffolk coast, where Robert Watson-Watt developed the first operational radar defence systems.

4) More-than-human spatialities

More-than-human spatialities of technical objects relate to one another outside of human consciousness. Machine-to-machine interactions hidden within black-box technologies sink into the background of human perception, creating atmospheres beyond their technical function. These atmospheres are real moments of space-time that shape the capacities and conduct of both humans and non-humans. More-than-human spatialities decentre the human perspectives of space, exposing the multiple complex of actors involved in the production of the digitally expanded city. Within this thesis the third drift, 'Invisible Geographies', made use of radio frequency (RF) receivers to convert the machine-to-machine communications of digital technologies into sound. The drift brought the attention of the participants to the more-than-human geographies of digital communications networks. The Invisible Geographies drift revealed the usually inaccessible unique spatial qualities of ubiquitous and mobile technologies. Building on the Invisible Geographies drift, I am currently experimenting with Software Defined Radio (SDR). By using SDR I can access a wider range of communications frequencies used by digital devices making them audible and revealing their unique machine-to-machine aesthetic qualities. At the 5th international, interdisciplinary Affect and Social Media conference, I will organise a new drift using SDR to carry out a live exploration of the more-than-human machine-to-machine communications within the conference venue.

5) Digitally Expanded Game of Psychogeography

I will conclude with the future of CODED GEOMETRY's mapping of a digitally expanded East London. As previously stated, the Limehouse Sailors' Mission was the secret location of

the 4th conference of the Situationist International, which was held between 24-28 September 1960 and the Psychogeographical Games were launched at the conference.

On the 16th February 2020, at Come Hell or High Water, at a performance event activated by Anne Bean, Hayley Newman, George Pringle and Sarah Andrew, at 3 Colts Gallery, five minutes' walk from Limehouse Sailors' Mission, I gave a talk calling for a digitally expanded game of psychogeography. I argued for a renewed practise of psychogeography in East London that explored all aspects of spatial production but which included the growing impact of digitality. As part of developing a digitally expanded game of psychogeography, CODED GEOMETRY is curating a series of walks organised by different artists and activists that explore the impact of the digital on spatial production in East London from multiple divergent perspectives.

8 References

Amin, A. and Thrift, N. 2017. *Seeing like a city*. Cambridge; Malden, MA: Polity Press.

Amoore, L., 2018. Cloud geographies: computing, data, sovereignty. *Progress in Human Geography* 42(1), pp.4-24.

Anca, P. 2009. Walter Benjamin: a methodological contribution, *International Political Sociology* 3, pp.238–254.

Ash, J., Kitchin, R. and Leszczynski, A. 2018. Digital turn, digital geographies? *Progress in Human Geography* 42(1), pp.25-43.

Ash, J., Kitchin, R. and Leszczynski, A. (eds). 2019. *Digital geographies*. Los Angeles, CA: SAGE Publications. Kindle Edition.

Ashton, K. 2009. That 'Internet of Things' thing. *RFID Journal*, 22 June. Available online at: http://www.rfidjournal.com/articles/view?4986 [Accessed 14/9/2016]

Atmel Corporation. 2005. Understanding the Requirements of ISO/IEC 14443 for Type B Proximity Contactless Identification Cards. Available online at: www.atmel.com/images/doc2056.pdf [Accessed 18/4/2016]

Baker, B. 2003. Maps of the London Underground: Iain Sinclair and Michael Moorcock's psychogeography of the city. *Literary London: Interdisciplinary Studies in the Representation of London* 1(1). Available online at: http://literarylondon.org/the-literary-london-journal/archive-of-the-literary-london-journal/issue-1-1/maps-of-the-london-underground-iain-sinclair-and-michael-moorcocks-psychogeography-of-the-city/ [Accessed 8/92019]

Baker, P. 2011. Secret city: psychogeography and the end of London.In: Kerr, J., Gibson, A. (eds.) *London: From Punk to Blair*. London: Reaktion.

Bakke, S. 2010. How principles of human-computer interactions could contribute in black-boxing complexities in information infrastructures. In *Information Systems Research Seminar in Scandinavia* (IRIS 33).

Barbrook, R. and Cameron, A. 1995. The Californian ideology, *Mute*, 1 September. Available online at:
http://www.metamute.org/editorial/articles/californian-ideology
[Accessed 26/06/2015]

Barrett, E. 2007. Foucault's 'What is an author': towards a critical discourse of practice as research. In: Barrett, E., and Bolt, B (eds.) *Practice as research: approaches to creative arts enquiry*. London: I.B.Tauris.

Bartle, R. 2003. *Designing virtual worlds*. Indianapolis. IN: New Riders.

Beckett, S. 1987. *Proust and three dialogues with Georges Duthuit*. London: John Calder.

Behrendt F. 2012. The sound of locative media. *Convergence*18, p. 283.

Benjamin, W. 1999. The work of art in the age of mechanical reproduction (1968).In: *Illuminations*. London: Pimlico, pp..

Bin, D. 1996. London Psychogeographical Association Newsletter and Manchester Area Psychogeographic. *Transgressions* 2/3, pp. 120-121.

Blum, A. 2012. *Tubes: a journey to the center of the internet*. New York: Ecco.

Bohlen, J. M. and Beal, G. M. 1957. The diffusion process. *Special Report* No. 18. Ames, IO: Agriculture Extension Service, Iowa State College, March. pp. 56–77.

Bonnett, A. 2006. The nostalgias of Situationist subversion. *Theory Culture Society* 23(5), pp. 23-48.

Bonnett, A. 2009. The dilemmas of radical nostalgia in British psychogeography. *Theory Culture Society* 26(1), pp. 45-70.

Bonnett, A. 2015. Walking through memory: critical nostalgia and the city. in; Richardson, T. (ed.), *Walking inside out: contemporary British psychogeography*. London; New York: Rowman and Littlefield, pp.75-88.

Bonta, M. and Protevi, J. 2006. *Deleuze and geophilosophy:*
a guide and glossary. Edinburgh: Edinburgh University Press.

Borden, 1999. The city of psychogeography (Situationist-inspired architectural ideas are creating architecture of an extraordinary range and inventiveness). In: *Architectural Design* 142, pp. 103-104.

Bowden, L. 1985. The story of IFF (identification friend or foe). *IEE Proceedings A*, *Physical Science, Measurement and Instrumentation, Management and Education-Reviews* 132(6), pp.435-437.

Bowker, G.C., Baker, K., Millerand, F. and Ribes, D. 2009. Toward information infrastructure studies: ways of knowing in a networked environment. In: *International handbook of internet research*. Dordrecht: Springer, pp. 97-117

Brewer, J. and Dourish, P. 2007. Imaging and imagining the city. In: *ACM Computer/Human Interaction Workshop: Imaging the City*, San José, CA.

Brewer, J. and Dourish, P. 2008. Storied spaces: cultural accounts of mobility, technology, and environmental knowing. *International Journal of Human-Computer Studies* 66, pp. 963-976

Bridger, A.J., 2013. Psychogeography and feminist methodology. *Feminism & Psychology*, 23(3), pp.285-298.

Brotton, J. 2012. *A history of the world in twelve maps*. London: Penguin.

Buck-Morss, S. 1992. Aesthetics and anaesthetics: Walter Benjamin's artwork essay reconsidered. *October* 62, pp.3-41.

Butler, T. 2006. A walk of art: The potential of the sound walk as practice in cultural geography. *Social & Cultural Geography* 7, pp. 889-908.

Butz, D. 2010. Autoethnography as sensibility. In: Delyser, D., Herbert, S., Aitken, S., and Crang, M.A. (eds.) *The SAGE handbook of qualitative geography*. London: SAGE, pp.321–334.

Cant, S. G. and Morris, N. J. 2006. Geographies of art and the environment. *Social & Cultural Geography* 7, pp. 857–861.

Chang, M. and Goodman, E. 2006. Asphalt games: Enacting place through locative media. *Leonardo Electronic Almanac* 14(3). Available online at: http://www.leoalmanac.org/wp-content/uploads/2012/07/Asphalt-Games-Enacting-Place-Through-Locative-Media-Vol-14-No-3-July-2006-Leonardo-Electronic-Almanac.pdf [accessed 3/ 2015].

Chapman, T. 2006. 'When in doubt, quote Ballard': an interview with Iain Sinclair. *Ballardian*. Available online at: http://www.ballardian.com/iain-sinclair-when-in-doubt-quote-ballard [Accessed 13/7/ 2014]

Colls, R. 2011. BodiesTouchingBodies: Jenny Saville's over-life-sized paintings and the 'morpho-logics' of fat, female bodies. *Gender, Place and Culture* 9(2), pp.175-192.

Combes, M., 1999. Simondon: Individu et collective. *Pour une philosophie du transindividuel*.

Cook, I. 2000. Social sculpture and connective aesthetics: Shelley Sacks's 'Exchange Values'. *Cultural Geographies* 7, pp. 337-343.

Cornell, L. and Varnelis, K. 2011. Down the line. . *Frieze,* 1 September. Available online at: https://frieze.com/article/down-line [Accessed 8/9/2019]

Cosgrove, D. 2001. *Apollo's eye: a cartographic genealogy of the earth in the western imagination*. Baltimore, MD: The John Hopkins University Press.

Coverley, M. 2006. *Psychogeography*. Harpenden: Pocket Essentials.

Cramer, F. 2005. *Code, culture, imagination, media design research*. Rotterdam: Piet Zwart Institute, Willem de Kooning Academy Hogeschool. Available online at: http://www.netzliteratur.net/cramer/wordsmadefleshpdf.pdf [Accessed 4/7/2014]

Crouch, D. 2010. Flirting with space: thinking landscape relationally. *Cultural Geographies* 17, pp. 5-18.

Curti, G.H., Aitken, S.C., Bosco, F.J. & Goerisch, D.D. 2011, "For not limiting emotional and affectual geographies: a collective critique of Steve Pile's 'Emotions and affect in recent human geography'", *Transactions of the Institute of British Geographers*, vol. 36, no. 4, pp. 590-594.

Dawney, L. 2011, "The motor of being: a response to Steve Pile's 'Emotions and affect in recent human geography'", *Transactions of the Institute of British Geographers*, vol. 36, no. 4, pp. 599-602.

Debord, G., 1958. Theory of the dérive. *Internationale situationniste*, 2(20.05), p.2015.

Debord, G. 1992. *In girum imus nocte et consumimur igni*. London: Pelagian.

De Certeau, M. and Mayol, P. 1998. *The practice of everyday lif*e, Volume 2: *Living and cooking*. Minneapolis, MN: University of Minnesota Press.

Deleuze, G. 1988. *Foucault*. London: The Athlone Press.

Deleuze, G. 1994. *Difference and repetition*. New York: Columbia University Press.

Deleuze, G. 2011. *Bergsonism*, New York: Zone Books.

Deleuze, G. and Guattari, F. 2005. *A thousand plateaus*. Minneapolis, MN: University of Minnesota Press.

DeSilvey, C. 2005. Salvage memory: constellating material histories on a hardscrabble homestead. *Cultural Geographies* 14, pp. 401-424.

DeSilvey, C. 2006. Observed decay: telling stories with mutable things. *Journal of Material Culture* 11, pp. 318–338.

De Souza e Silva, A. 2006. From cyber to hybrid: mobile technologies as interfaces of hybrid spaces. *Space and Culture* 9(3), pp. 261–278.

Dewsbury, J-D., Harrison, P., Rose, M. and Wylie, J. 2002. Enacting geographies. *Geoforum* 33(4), pp. 437-440

Dewsbury, J-D. 2011. Performative, non-representational, and affect-based research. In: Delyser D., Herbert S., Aitken S., and Crang, M.A. (eds.) *The SAGE handbook of qualitative geography*. London: SAGE, pp. 321–334.

Dodge, M. and Kitchin, R. 2000. Exposing the 'second text' in maps of the Network Society. *Journal of Computer Mediated Communication* 5(4), JCMC543. Available online at: http://jcmc.indiana.edu/vol5/issue4/dodge_kitchin.htm [Accessed 13/2/2007]

Dodge, M. and Kitchin, R. 2001. *Mapping cyberspace*. London: Routledge.

Dodge, M. 2004. Seeing inside the cloud: some ways to map the internet. *Media Art Net Lectures, Mapping.* ZKM, Karlsruhe, Germany, 24 January.

Dourish, P. 2004. Where the action is: the foundations of embodied interaction. Cambridge, MA: MIT Press.

Dourish, P. 2006. Re-space-ing place: place and space ten years on. In: *CSW '06: Proceedings of the 2006 20th Anniversary Conference on Computer-supported Cooperative Work*. Banff, Canada, November 4-8 2006. New York: ACM, pp. 299-308.

Dourish, P. and Bell, G. 2009. *'Resistance is Futile': reading science fiction alongside ubiquitous computing.* Available online at http://www.dourish.com/publications/2009/scifi-puc-draft.pdf [Accessed 8/9/2014]

Dourish, P. and Bell, G. 2011. *Divining a digital future*. Cambridge, MA; London: The MIT Press.

Dovey, K. 2009. *Becoming places: urbanism/architecture/identity/power*. London: Routledge.

Dreyfus, H.L. and Hubert, L.1991. *Being-in-the-world: A commentary on Heidegger's* Being and Time, Division I (Vol. 1). Cambridge, MA: The MIT Press.

The Economist, 2017. *The world's most valuable resource is no longer oil, but data*. [online] Available at: <https://www.economist.com/weeklyedition/2017-05-06> [Accessed 6 June 2020].

Elias, A. J. 2012. Psychogeography, détournement, cyberspace. *New Literary History* 41(4), pp. 821-845.

Farman, J. 2014. *The mobile story: narrative practices with locative technologies*. London: Taylor and Francis Group. Kindle Edition.

Farman, J. 2015. Stories, spaces, and bodies: the production of embodied space through mobile media storytelling. *Communication Research and Practice* 1(2), pp.101-116.

Farman, J., 2015a. Infrastructures of mobile social media. *Social Media + Society* 1(1), p.2056305115580343.

Farman, J. 2015b. The materiality of locative media: on the invisible infrastructure of mobile networks. In: Herman, A., Hadlaw, J. and Swiss, T. (eds.), *Theories of the mobile internet: materialities and imaginaries*. New York, NY: Routledge, pp. 45-59.

Foucault, M. 1984. Des espaces autres *Architecture /Mouvement/ Continuité* 5 (October), pp. 46-49. Translated by Miskowiec, J. 1986. Of other spaces: utopias and heterotopias. *Diacritics* 16(1), pp. 22-27.

Foucault, M. 1995. *Discipline and punish*. London: Vintage.

Frayling, C. 1993. Research in art and design. *Royal College of Art Research Papers* 1(1), 1-5.

Freeman, J., DiSalvo,C., and Nitsche, M.. Rediscovering the city with UrbanRemix. *Leonardo* 45(5), pp. 478-479.

Friedberg, A. 1993. *Window shopping: cinema and the postmodern*. Los Angeles, CA: University of California Press.

Fuchs, C. 2007. *Internet and society: social theory in the information age*. London: Routledge.

Fuller, M. 2005. *Media ecologies: materialist energies in art and technology*. Cambridge, MA; London: The MIT Press.

Gandy, M. 1997. Contradictory modernities: conceptions of nature in the art of Joseph Beuys and Gerhard Richter. *Annals of the Association of American Geographers* 87, pp.636-665.

Glass, R.L., 1964. *London: aspects of change* (Vol. 3). London: MacGibbon & Kee.

Graham, M., Zook, M. and Boulton, A. 2013. Augmented reality in urban places: contested content and the duplicity of code. *Transactions of the Institute of British Geographers* 38(3), pp. 464-479.

Graham, S. (ed.) 2010. *Disrupted cities: when infrastructure fails*. London: Routledge.

Graham, S. 2011. *Cities under siege: the new military urbanism*. London: Verso.

Greenfield, A. 2010. *Everyware: the dawning age of ubiquitous computing*. Berkeley, CA: New Riders.

Grosz, E. 2012. Identity and individuation: some feminist reflections. In: De Boever, A. Murray, A., Roffe, J., & Woodward, A. (eds.) 2012, *Gilbert Simondon: being and technology*. Edinburgh: Edinburgh University Press, pp.

Hallward, P. 2006. *Out of this world: Deleuze and the philosophy of creation*. London: Verso:

Hansmann, U. 2003. Pervasive computing: the mobile world. Dordrecht: Springer.

Haraway, D. 1988. Situated knowledges: the science question in feminism and the privilege of partial perspective. *Feminist studies* 14(3) , pp. 575-599.

Haraway, D. 1991. A cyborg manifesto: science, technology, and socialist-feminism in the late twentieth century [1985]. In: *Simians, cyborgs and women: the reinvention of nature.* New York: Routledge, pp.149-181.

Haraway, D. 1997. *Modest_witness@second_millennium: FemaleMan_meets_OncoMouse: feminism and technoscience*. New York: Routledge.

Harley, J. B. 1988. Maps, knowledge, and power. In: Cosgrove, D.(ed.) *The iconography of landscape*. Cambridge: Cambridge University Press, pp. 277-312.

Harris, C. 2006. The omniscient eye: satellite imagery, 'battlespace awareness', and the structures of the imperial gaze. *Surveillance & Society* 4 (1/2), pp. 101-122.

Harrison, S. and Dourish, P. 1996. Re-place-ing space: the roles of place and space in collaborative systems. In: *CSCW '96: Proceedings of the 1996 ACM conference on computer supported cooperative work*, Boston, USA, 16-20 November. New York: ACM, pp. 67-76.

Harrison, P. 2000. Making sense: embodiment and the sensibilities of the everyday. *Environment and Planning D: Society and Space,* 18, pp. 497-518.

Hart, J. 2004. A new way of walking. *Utne Reader* July/August. Available online at: http://www.utne.com/community/a-new-way-of-walking.aspx [Accessed 15/ 10/2015]

Hartl, D L. and Jones, E. 1998. *Genetics: principles and analysis*. Fourth ed. Boston, MA: Jones and Bartlett.

Hawkins, H. 2010a. The argument of the eye: cultural geographies of installation art. *Cultural Geographies* 17, pp. 1-19.

Hawkins, H., 2011. Dialogues and doings: sketching the relationships between geography and art. *Geography Compass*, 5(7), pp.464-478.

Hawkins, H. 2013. Geography and art, an expanding field: site, the body and practice. *Progress in Human Geography* 37(1), pp. 52-71.

Heer, J. and Khooshabeh, P. 2004. Seeing the invisible. Paper presented at the *Association for Computing Machinery Conference on Advanced Visual Interfaces Conference*, May 25-8, Lecce, Italy.

Holmes, B., 2004. Drifting through the grid: psychogeography and imperial infrastructure. *Springerin*, 3.

Holmes, B. 2009. Guattari's schizoanalytic cartographies. Available online at: https://brianholmes.wordpress.com/2009/02/27/guattaris-schizoanalytic-cartographies/ (accessed June 7, 2017).

International Situationniste #1 (SI).1981a. In: K. Knabb (ed.) *Situationist International anthology.* Berkeley, CA: Bureau of Public Secrets.

International Situationniste #2 (SI).1981b. Theory of the dérive. In: K. Knabb (ed.) *Situationist International anthology.* Berkeley, CA: Bureau of Public Secrets

Johnson, C. 2007. Living a virtual life on the internet. *CBS News* 8 February. Available online at: www.cbsnews.com/news/living-a-virtual-life-on-the-internet [accessed 26 February 2019].

Jordan, J. 2002. The art of necessity: The subversive imagination of anti-road protest and reclaim the streets. In: Duncombe, S (ed). *Cultural resistance reader*. London: Verso, pp. 347-357.

Keep, C. 2009. Situationism, aestheticism, and the psychogeography of the city. *Canadian Review of Comparative Literature/Revue Canadienne de Littérature Comparée*, 36(4), pp. 370-380.

Keiller, P. 1994. *London* [film]. London: Koninck/Channel 4.

Keiller, P.1997. *Robinson in space* [film]. London: BBC/Koninck.

Kerr, J. and Gibson, A. (eds.). 2011. *London: from punk to Blair*. London: Reaktion.

Kingsbury, P and, Jones III, J. P. 2008. Walter Benjamin's Dionysian adventures on Google Earth. *Geoforum* 40, pp. 502-513.

Kinsley, S. 2014. The matter of virtual geographies. *Progress in Human Geography* 38(3), pp. 364-384.

Kitchin, R. and Dodge, M. 2007. Rethinking maps. *Progress in Human Geography*, 31(3), pp.331-344.

Kitchin, R. and Dodge, M. 2011. *Code/space: software and everyday life*. Cambridge, MA: The MIT Press.

Kittler, F.A. 1999. *Gramophone, film, typewriter*. Stanford, CA: Stanford University Press.

Kittler, F.A. 2013. *Literature, media, information systems*. New York: Routledge.

Kittler, F. A. and Enns, A. 2010. *Optical media*. Cambridge: Polity Press.

Larkin, B. 2013. The politics and poetics of infrastructure. *Annual Review of Anthropology* 42, pp. 327-343.

Latour, B. 1987. *Science in action*. Cambridge, MA: Harvard University Press.

Latour, B. 1999. *Pandora's hope: essays on the reality of science studies*. Cambridge, MA: Harvard University Press.

Law, J. and Singleton, V. 2000. Performing technology's stories: on social constructivism, performance and performativity. *Technology and Culture* 41(4), pp. 765-775.

Leavy, P. 2009. *Method meets art: arts-based research practice*, New York: The Guilford Press.

Lefebvre, H. 1991. *The production of space*. Oxford: Blackwell.

Lefebvre, H. 2004. *Rhythmanalysis: space, time and everyday life*. London: A&C Black.

Lepecki, A. and Banes, S. 2006. lntroduction: the performance of the senses. In: Lepecki, A. and S. Banes (eds.) *The senses in performance* (Worlds of performance). London: Routledge, pp 1-7.

Lorimer, H. 2005. Cultural geography: the busyness of being 'more-than-representational'. *Progress in Human Geography* 29(1), pp. 83–94

Lorimer, H. 2006. Herding memories of humans and animals. *Environment and Planning D: Society and Space* 24, pp. 497–518.

Lovejoy, A. and Hawkins, H. 2009. *Insites: an artists' book*. Penryn: Insites Press.

Löwy, M. 1998. Consumed by night's Fire: the dark romanticism of Guy Debord. *Radical Philosophy* 87, pp. 31-4.

Luckhurst, R. 2011. Occult London. In Kerr, J. Gibson, A. (eds.) *London: from punk to Blair*. London: Reaktion, pp. 335-340.

Lunenfeld, P. (ed.) 2000. *The digital dialectic: new essays on new media*. Cambridge, MA: The MIT Press.

McCormack, D. 2005. Diagramming power in practice and performance. *Environment and Planning D: Society and Space* 23(1), pp. 119-147.

Machiraju, R. 2014. Fixing the Mercator projection for the internet age. *IEEE Computer* 47(1), p.9

Mackenzie, A. 2002. *Transductions: bodies and machines at speed*. London: Continuum.

Mackenzie, A. 2003. Transduction: invention, innovation and collective life. Unpublished manuscript. Available online at: http://www.lancaster.ac.uk/staff/mackenza/papers/transduction.pdf [Accessed 23/6/2015]

Manuel, C. 2000. *The rise of the network society*. Oxford: Blackwell.

Marcus, G. 2011. *Lipstick traces: a secret history of the twentieth century*. London: Faber & Faber.

Massey, D. 1993. Power-geometry and a progressive sense of place. In: Bird, J., Curtis, B., Putnam, T. and Tickner, L. *Mapping the futures: local cultures, global change.* London: Routledge, pp. 75-85.

Massey, D. 2006. *For space*. London: SAGE Publications. Kindle Edition.

Massumi, B. 1987. Notes on the translation and acknowledgements. In: Deleuze, G. and Guattari, F., *A thousand plateaus*. Minneapolis, MN: University of Minnesota Press, 1987, pp.xvi-xx.

Massumi, B. 1995. The autonomy of affect. *Cultural Critique* 31, pp.83-109.

Massumi, B. 2002. *Parables for the virtual: Movement, affect, sensation*. Duke University Press.

Massumi, B., 2008. The thinking-feeling of what happens. In: Massumi, B., Mertins, D., Spuybroek, L., Marres, M., and Hubler, C. *Interact or die: there is drama in the networks*. Rotterdam: NaI Publishers, pp.70-91.

Massumi, B. 2015. Politics of affect. Cambridge: Polity Press. [s.l. : Wiley, Kindle Edition].

Mell, P. and Grance, T. 2011. *The NIST definition of cloud computing.Technical report SP800-145*. Gaithersburg, MD: National Institute of Standards and Technology.

Merleau-Ponty, M. 2006. *The Phenomenology of perception* [1945]. London: Routledge. [Taylor and Francis, e-library].

Merriman, P. and Webster, C. 2009. Travel projects: landscape, art, movement. *Cultural Geographies* 16, pp. 525-535.

Meyrowitz, J. 2005. The rise of glocality: new senses of place and identity in the global village. In: Nyíri, K. *A sense of place: the global and the local in mobile communication*. Vienna: Passagen Verlag, pp. 21-30.

Monmonier, M. 1996. *How to lie with maps*. Chicago, IL: University of Chicago Press.

Monmonier, M. 2004. *Rhumb lines and map wars: a social history of the Mercator projection*. Chicago, IL: University of Chicago Press.

Moores, S. 2004.The doubling of place: electronic media, time-space arrangements and social relationships. In: B. Couldry and A. McCarthy (eds.) *Media/space: place, scale and culture in a media age.* Comedia series. London: Routledge

Nieuwenhuy, C. 1971. Autodialogue on New Babylon, *Opus International* #27, September. English translation published online at http://www.notbored.org/autodialogue.html (Accessed 21/10/2015)

Office for National Statistics. 2015. *Consumer price inflation: the 2015 basket of goods and services*. Available online at: https://www.ons.gov.uk/economy/inflationandpriceindices/articles/consumerpriceinflationbasketofgoodsandservices/2015 [Accessed 8/09/2019]

Parkhill, D.F. 1966. *The challenge of the computer utility*. Reading: Addison-Wesley.

Patrick, G. T. Healey, G. W., Arash, E., Reeves, A.J. and Light, A. 2008. Communication spaces. in *Computer Supported Cooperative Work* 17(2-3).

Pickles, J. 1995. *Ground truth: the social implications of Geographic Information Systems*. New York: Guildford.

Pile, S. 2010. Emotions and affect in recent human geography. *Transactions of the Institute of British Geographers,* 35(1), pp.5-20.

Pinder, D. 2000. 'Old Paris is no more': geographies of spectacle and antispectacle. *Antipode* 32(4), pp. 357-86.

Pinder, D., 2005. Arts of urban exploration. *Cultural geographies*, 12(4), pp.383-411.

Pinder, D. 2008. Urban interventions: art, politics and pedagogy. *International Journal of Urban and Regional Research* 32(3), pp. 730-736.

Pinder, D. 2013. Dis-locative arts: mobile media and the politics of global positioning, *Continuum: Journal of Media & Cultural Studies* 27(4), pp. 523-541

Pink, S. 2015. *Doing sensory ethnography*. London: Sage.

Poslad, S. 2011. *Ubiquitous computing: smart devices, environments and interactions*. Chichester: John Wiley & Sons.

Powell, A. 2009. Jack the Ripper's bodies–without–organs: affect and psychogeography under the scalpel in relation to 'From Hell'. *Irish Gothic Horror Journal* 7.

Pratt, A. 2017. The rise of the quasi-public space and its consequences for cities and culture. *Palgrave Communications* 3(1), p.36.

Raffl, C., Hofkirchner, W., Fuchs, C. and Schafranek, M. 2008. The web as a techno-social system: the emergence of Web 3.0. In: Trappl, R. (ed.) *Cybernetics and systems*. Vienna: Austrian Society for Cybernetic Studies, pp. 604-609.

Redhead, S. 2004. *Paul Virilio: theorist for an accelerated culture*. Toronto: University of Toronto Press.

Reed-Danahay, D. (ed.) 1997. *Auto/ethnography:rewriting the self and the social*. (Explorations in anthropology). Oxford: Berg.

Rendell, J. 2008. Critical spatial practice. In: *Art incorporated*. Denmark: Kunstmuseet Koge Skitsesamling. Available online at: http://www.janerendell.co.uk/wp-content/uploads/2009/06/critical-spatial-practice.pdf [Accessed 8/9/2019]

Rumney, R. 2002. *The consul*. San Francisco, CA: City Lights Books.

Rumney, R. 2010. About the historification of the Situationist International: Ralph Rumney in conversation with Stewart Home. *Stewart Home Society.* Available at: http://www.stewarthomesociety.org/interviews/rumney.htm [accessed 28th September 2015].

Sadler, S. 1999. *The Situationist city*. Cambridge, MA; London: The MIT Press.

Simondon, G. 1980. On the mode of existence of technical objects, trans. Ninian Mellamphy. Unpublished paper. London, ON: University of Western Ontario.

Sinclair, I. 1997. *Lights out for the territory*. London: Granta.

Sinclair, I. 1998. *Lud heat: a book of the dead hamlets*. London: Granta.

Scrivener, S. 2009. The roles of art and design process and object in research. In: Nimkulrat, N. and O'Riley, T. (eds.), *Reflections and connections: on the relationship between creative production and academic research*. Helsinki: University of Art and Design

Shouse, E, 2005, Feeling, emotion, affect. *M/C Journal* 8(6). Available online at: http://journal.media-culture.org.au/0512/03-shouse.php [accessed 22/2/2019].

Smith, P. 2010. The contemporary dérive: a partial review of issues concerning the contemporary practice of psychogeography. *Cultural Geographies* 17(1), pp. 103-122

Star, S.L. and Ruhleder, K. 1996. Steps toward an ecology of infrastructure: design and access for large information spaces. *Information Systems Research*, 7(1), pp.111-134.

Suchman, L.A. 1987. *Plans and situated actions: The problem of human-machine communication*. Cambridge: Cambridge University Press.

Thompson, N. and Sholette, G. (eds.) 2004. *The interventionists: users' manual for the creative disruption of everyday life*. North Adams, MA; Cambridge, MA: MASS MoCA; The MIT Press.

Thompson, N. 2008. *Experimental geography: radical approaches to landscape, cartography and urbanism.*[exhibition catalogue] Brooklyn; New York: Melville House; Independent Curators International.

Thrift, N. 1997. The still point: resistance, expressive embodiment and dance; In Pile, S. and Keith, M. (eds.) *Geographies of resistance*. London; New York: Routledge.

Thrift, N. and Dewsbury, J-D. 2000. Dead geographies and how to make them live. *Environment and Planning D: Society and Space* 18, 411-432.

Thrift, N. 2008. Non-representational theory: Space/politics/affect, London: Routledge.

Toscano, A. 2006. *The theatre of production: philosophy and individuation between Kant and Deleuze* (Renewing philosophy). Basingstoke: Palgrave Macmillan.

Totaro, T. 1999. Gilles Deleuze's Bergsonian film project, Parts 1 and 2. *Offscreen* 3 (3) Available online at: https://offscreen.com/view/bergson2. [Accessed 5/1/2019]

Tuters, M. 2012. From mannerist situationism to situated media. *Convergence: The International Journal of Research into New Media Technologies*18, pp. 267-282.

Vattimo, G. 1992. *The transparent society*, Baltimore, MD: The John Hopkins University Press.

Violino, B. 2005. The history of RFID technology. *RFID Journal*. Available online at: www.rfidjournal.com/articles/pdf?1338 [Accessed 20/4/2016]

Wark, M. 2015. *The beach beneath the street: The everyday life and glorious times of the Situationist International*. Verso. Kindle Edition.

Weiser, M. 1991. The computer for the 21st century. *Scientific American* 265(3), pp.94-105.

Weiser, M. 1993. Ubiquitous computing. *Computer* 26(10), pp.71-72.

Weiser, M. 1994. Creating the invisible interface (invited talk). In: *UIST '94*: *Proceedings of the 7th annual ACM symposium on user interface software and technology.* 2-4 November, Marina del Rey, CA . New York: ACM.

Wilken, R. 2012. Locative media: from specialized preoccupation to mainstream fascination. *Convergence: The International Journal of Research into New Media Technologies* 18, pp. 243-247.

Winthrop-Young, G. and Gane, N. 2006. Friedrich Kittler: an introduction. *Theory, Culture & Society* 23(7-8), pp.5-16.

Wood, D. 1992. *The power of maps.* New York: Guilford Press.

Wood, D. 2010. *Rethinking the power of maps.* New York: Guilford Press.

Wood, D. 2010a. Lynch Debord: about two psychogeographies. *Cartographica: The International Journal for Geographic Information and Geovisualization* 45(3), pp.185-199.

Woodhouse, E. and Patton, J.W. 2004. Design by society: science and technology studies and the social shaping of design. *Design Issues* 20(3)

Wylie, J. 2005. A single day's walking: narrating self and landscape on the South West Coast Path. *Transactions of the Institute of British Geographers* 30, pp. 234–247.

Wylie, J. 2007, *Landscape*. London: Routledge

Wylie, J. 2007a. The spectral geographies of W.G Sebald. *Cultural Geographies* 14 (2), pp. 171-88

Zeffiro, A. 2012. A location of one's own: a genealogy of locative media. *Convergence: The International Journal of Research into New Media Technologies* 18, p. 249

Zhang Q., Cheng, L. and Boutaba, R. 2010 Cloud computing: state-of-the-art and challenges. *Journal of Internet Services and Applications* 1, pp. 7–18.

Zhou, Z., Chen, X., Li, E., Zeng, L., Luo, K. and Zhang, J., 2019. Edge intelligence: Paving the last mile of artificial intelligence with edge computing. Proceedings of the IEEE, 107(8), pp.1738-1762.

Žižek, S. 2007. Deleuze's Platonism: ideas as real. Available online at: http://www.lacan.com/zizplato.htm. [Accessed 30/6/2015].

Zook, M.A. and Graham, M. 2007a. The creative reconstruction of the Internet: Google and the privatization of cyberspace and DigiPlace. *Geoforum,* 38(6), pp. 1322-1343.

Zuboff, S., 2019. The age of surveillance capitalism: The fight for a human future at the new frontier of power. Profile Books.

Zuboff, S., Möllers, N., Wood, D.M. and Lyon, D., 2019. Surveillance Capitalism: An Interview with Shoshana Zuboff. *Surveillance & Society*, 17(1/2), pp.257-266.s

Appendix A: Presentation of Research

16th July 2019 – Psychogeography in the Digital City – research presentation at Digital Ecologies II: Fiction Machines, a one day international symposium held at Bath Spa University.

12th April 2019 – Invisible Geographies Drift - performance presentation at Approaching Estate, methodologies for practices of site and place, held at the Furtherfield Gallery commons space in Finsbury Park. The event was organised by the Sensingsite research group based at Central St. Martins.

23 March 2016 – The Manvers Main Complex - Performance paper presented at the Affect and Social Media conference held at the University of East London.

28th-31st October 2014 - Psychogeography in the digitally expanded city. Video documentation and performative presentation of my phd research. Presented at the UCL Urban Laboratory's annual exhibition exploring innovative urban research, UCL Slade Research Centre, Woburn Square London WC1H 0HB

23 April 2014 - Invisible Geographies performance presentation. Performed as part of the Materialising Site stream of sensingsite 2014, a peer review fine art research conference organised by Fine Art Research, Central Saint Martins, University of the Arts London.